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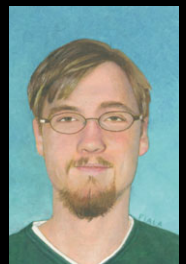
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CORRECTIONS:

The URL we printed for Yahoo! Widgets on page 75 of the March issue (widgets.yahoo.net) was incorrect. The proper URL is widgets.yahoo.com.

Infinite Loops

Strange stats and other oddball
items from computing's periphery

85, 97, 99





"I find your lack of a Death Star White Paper disturbing."

More than a thousand gamers trekked to Goldsboro, N.C., in late January for the Carolina Games Summit, formerly known as the Goldsboro Gaming Expo. The third-annual event was held at Wayne Community College and featured a full day of tournaments, guest speakers, and rambunctious carryings-on. Our favorite moment? Watching a dozen members of the 501st Legion (aka Vader's Fist) ambush people strolling through the building commons.

EDITOR'S NOTE

Call me crazy, but I totally saw this Microsoft-Yahoo! thing coming. OK, it's not really that crazy, and I know I'm far from the only one who has speculated on a possible joining of Microsoft and Yahoo! of some kind. But think back for a moment to the Xbox 360 launch in 2005; Microsoft ran a joint promotion with Mountain Dew where you could enter a drawing and win one of more than 9,000 X360s, one of which was given away every 10 minutes. In order to enter, you had to register at the promo site, which required a Yahoo! ID.

Now, I understand that sometimes marketing efforts lead to partnerships that require some compromise, and maybe I should just go get fitted for a tinfoil hat and call it a day. But I remember marveling at the time at this turn of events. Microsoft, which has obviously invested a few bucks in its Hotmail and MSN Web brands, sending would-be Xbox winners to register for Yahoo! email addresses! I bent the ear of more than a few people at the time, telling them it wouldn't be long before Microsoft and Yahoo! teamed up one way or another.

I suppose it's not completely accurate to characterize Microsoft's Yahoo! takeover bid as the companies "teaming up," at least not from what I've read about Yahoo!'s initial reaction to the offer. But the way I see it, this was pretty much inevitable. Whether Jerry Yang and his posse are angling for a more lucrative offer or they genuinely want to block the deal, I highly doubt Microsoft would go public with an offer like this without being pretty confident of pulling it off.

Where does that leave us? Well, pretty much in the same spot we're in now, search-wise. Even if a Microsoft takeover effectively combines the folks who use MSN and Yahoo! to search the Web, Google will still likely be the search leader. But what about email? Both Yahoo! Mail and Hotmail currently boast more users (or at least get far more hits) than Gmail, and as I'm sure you've noticed, free Webmail is a pretty apt way to deliver advertising, too.



Chris Trumble, Publication Editor, *CPU*



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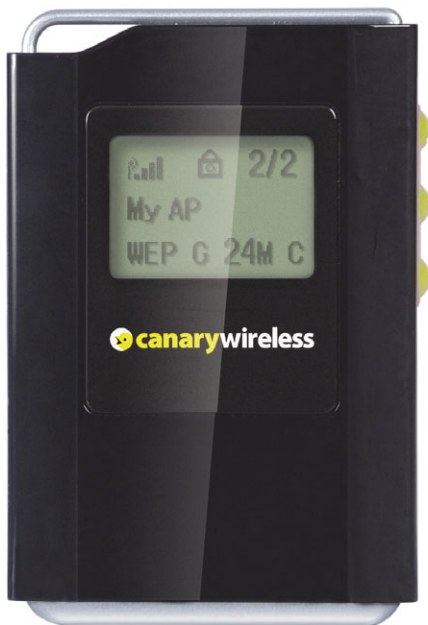
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Canary Wireless Sings A New Wi-Fi Tune

Another CES has come and gone, giving us more new-product announcements than an army of tech journalists could give their proper due. As usual, the big players grabbed the lion's share of the pub, while smaller companies garnered less, including Canary Wireless and its second-gen Digital Hotspotter HS-20 (\$59.95), a Wi-Fi detector/analyzer with a scrollable, backlit LCD (96 x 64) displaying network ID, encryption status, signal strength, and other details of 802.11b/g/n networks. The 2-ounce HS-20 runs on two AAAs, doesn't need additional software, and measures just 2 x 3 x 0.5 inches. Canary also says the use of a true 802.11 engine means there are no false Bluetooth readings. The HS-20 is expected to start singing in Q1 2008.

Shuttle Gets Cheap With The KPC

Remember when getting a low-cost PC meant building it yourself? Not so, anymore. Cheap, prebuilt systems are all the rage, and far be it from Shuttle to be left out. The company announced plans in January to sell the \$199 mini-ITX-based, Linux-running KPC probably starting in Q1. Definite specs weren't set at press time, but the KPC reportedly will include a single-core Intel Celeron 420, 945GC chipset, 512MB RAM, and up to 80GB storage. Still not definite is if the KPC will include a PCI Express slot and optical drive, although early word is it won't. A \$99 bare-bones version is also rumored with 1GB memory and Core 2 Duo options.



Logitech's Multimedia Madness

If you dig Logitech's multimedia-centric gear, you're in for good times. Among the company's new products is



the Harmony One Advanced Universal Remote (\$249.99), which replaces the Harmony 880 and offers revised software and a full-color touchscreen (220 x 176). Elsewhere, the wireless, backlit diNovo Mini (\$149.99; 5.98 x 3.5 x 1.08 inches) is part 63-key, Bluetooth 2.0 keyboard and part TV/home-theater wireless remote (with a range up to 30 feet) with rechargeable Li-Ion batteries and a four-way ClickPad for alternative navigating from your big, comfy couch. Want more? Logitech also has a new Squeezebox Duet system (\$399.99) with a 2.4-inch LCD to pump networked music via 802.11b/g throughout your house.



Nvidia Gets Artsy

Dangle a Quadra FX 5500 PCI-E card in front of an artist, and he'll come up with something like Vaclav Pajkrt's "Growth of a cubic bacteria." Nvidia and the CG-Society recently named Pajkrt's work the winner of the jointly sponsored NVArt "Amazing Creations" challenge. Celebrating the "intersection of art and technology," the contest asked graphic artists to create images that captured "the essence of something that could only exist in the virtual world." What the judges didn't want was "fantasy creatures, games characters, etc.," as those "are too common in both digital and traditional fantasy art." For winning, Pajkrt won two Nvidia Quadros worth \$6,000, a \$10,000 trip to San Francisco, and face time with Nvidia CEO Jen-Hsun Huang. Check the entries out at events.cgsociety.org/NVArt/01/winners.php. ▲



Hardware Mole

A Printer That Hangs Out

Printers have come a long way in terms of reducing their footprints, but the Hanging Printer is ridiculous. Although it's only a concept, as presented by designers Hee Kim, Hyung Il Kim, and Woo Seok Park, only the Hanging Printer's paper feeder and print head would be visible from the desktop. Using a 90-degree angled design, the Hanging Printer's other components would remain out of sight entirely, either hidden under the desk or over its edge. An LCD embedded in the case would keep you updated on print jobs, however. Looks like a money-maker to us. ▲



Halo Hits The Hardwood

How much does Gilbert Arenas, All-Star guard of the NBA's Washington Wizards, love Halo? Enough to not only sponsor pro online team "Final Boss" but also create his own laser-etched, Adidas-manufactured Halo sneaker. Arenas, who has been absent most of



the 2007-2008 season with an injury, was to wear the Halo sneaks (one of 20 pairs he's helped design) Feb. 8 upon their release. Getting a pair yourself may be harder than beating Final Boss, though, as only 100 pairs were scheduled to be made available. Still, by the looks of the shoes, Arenas should stick to knocking down treys

and leave shoe design up to professionals. ▲

Motus' Darwin Evolves The Wiimote

Expected in time for the holidays, the Darwin controller from Motus looks like it will take motion-sensing gaming up a considerable notch. Resembling a Hattori Hanzo sword handle, the Darwin uses gyroscopes, accelerometers, and a compass to track motion rather than infrared signals, meaning no need for a sensor bar, Wii fans. The Darwin is reportedly based on Motus' existing iClub golf controller and will work with PCs and multiple consoles. Additionally, Motus claims Darwin is faster and more accurate than the Wiimote. To get in on development, kits are available at devkit@motusgames.com. Those interested in early testing can contact Motus at iwantonenow@motusgames.com. ▲



Atheros Shrinks Wi-Fi Wireless Networking Chips So They Can Fit In The Tiniest Applications

Atheros Communications said in the fall that its tiny Wi-Fi chips would be used in a range of exciting new applications. It revealed at the International Consumer Electronics Show in January that its chips are used in the award-winning Eye-Fi SD memory cards. The cards have a built-in wireless networking antenna that lets them automatically upload digital camera images to networked computers or even Internet photo sites such as Flickr. The Atheros ROCm mobile WLAN chips in the Eye-Fi cards are able to get wireless reception even through the metal casing of digital cameras. Eye-Fi cards will be used in a variety of cameras, including models from Nikon. ▲



Experimental Radar Chip Might One Day Save Lives By Detecting Road Hazards

Can a chip warn you if you're about to get in a car wreck? Researchers at the University of Florida and the Semiconductor Research Corp. research consortium say those aren't crazy questions. They announced they've made progress in developing an automotive radar chip that could cost just \$10 to make. Usually, radar systems cost thousands of dollars. As a result, car makers could add safety features such as detecting when a driver should slam on the breaks. Current chips use exotic materials made of gallium arsenide or indium phosphide. By contrast, the university and the SRC created digital silicon chips based on the complimentary metal-oxide semiconductor process used in most chips. The researchers say that companies such as IBM, Texas Instruments, and Freescale are interested in the technology. ▲

Algae Could Become Useful In Nanotechnology Chip Production

When it comes to manufacturing, you can't get greener than algae. The single-celled phytoplankton, known as diatoms, account for 20% of the carbon dioxide removed from the earth. So scientists at NimbleGen Systems in Madison, Wis., are toying with the idea that algae could be used to lay tiny patterns down on chips in the future. The researchers have identified 75 genes out of 13,000 that control the formation of silicon dioxide patterns in diatoms. Michael Sussman, founder of NimbleGen and a biochemistry professor at the University of Wisconsin-Madison, says that this discovery could be used to precisely control the patterns created by algae, which in turn could be used for the nanofabrication of chips. One big help is that the tiny animals are so small they could potentially assemble submicron patterns on chips that even the finest photolithography tools can't mimic. Diatoms build their shells by depositing tiny lines of silicon dioxide, the most common insulator used in making chips. ▲

Watching The Chips Fall

Here is pricing information for AMD and Intel CPUs.

*Retail price
** Manufacturer's price per 1,000 units
Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com

CPU	Released	Original price	Last month's price	Current price
AMD Athlon 64 X2 Dual-Core 5600+ AM2 only	12/12/2006	\$505**	\$139	\$138
AMD Athlon 64 X2 Dual-Core 6000+ AM2 only	2/20/2007	\$464**	\$158	\$158
AMD Athlon 64 X2 Dual-Core 6400+ AM2 only	8/20/2007	\$251**	\$159	\$179
AMD Athlon 64 FX-70	11/30/2006	\$599/pair	\$325	\$323
AMD Athlon 64 FX-72	11/30/2006	\$799/pair	\$325	\$330
AMD Athlon 64 FX-74	11/30/2006	\$999/pair	\$319	\$319
AMD Phenom 9500	11/19/2007	\$251	\$209	\$209
AMD Phenom 9600	11/19/2007	\$283	\$224	\$245
AMD Phenom 9600 Black Edition	12/23/2007	\$251	\$239	n/a
Intel Core 2 Duo E6540	7/16/2007	\$163**	\$170	\$256
Intel Core 2 Duo E6550	7/16/2007	\$163**	\$168	\$166
Intel Core 2 Duo E6600 2.4GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	\$316**	\$199	\$199
Intel Core 2 Duo E6700 2.66GHz 4MB cache 1,066MHz FSB 65nm	7/27/2006	\$530**	\$327	\$319
Intel Core 2 Duo E6750	7/16/2007	\$183**	\$189	\$189
Intel Core 2 Duo E6850	7/16/2007	\$266**	\$274	\$271
Intel Core 2 Duo E8190 45nm	1/7/2008	\$163**	\$163**	n/a
Intel Core 2 Duo E8200 45nm	1/7/2008	\$163**	\$163**	n/a
Intel Core 2 Duo E8400 45nm	1/7/2008	\$183**	\$183**	n/a
Intel Core 2 Duo E8500 45nm	1/7/2008	\$266**	\$266**	n/a
Intel Core 2 Quad X6800 2.93GHz 4MB cache 1,066 MHz FSB 65nm	7/27/2006	\$999**	\$1,036	\$910
Intel Core 2 Quad Q6600	1/8/2007	\$851**	\$274	\$278
Intel Core 2 Quad Q6700	7/16/2007	\$530**	\$479	\$537
Intel Core 2 Quad Q9300 45nm	1/7/2008	\$266**	\$266**	n/a
Intel Core 2 Quad Q9450 45nm	1/7/2008	\$316**	\$316**	n/a
Intel Core 2 Quad Q9550 45nm	1/7/2008	\$530**	\$530**	n/a
Intel Core 2 Extreme Quad QX9650 3.0 GHz 12 MB cache 45 nm	11/12/2007	\$999**	\$1,052	\$1,109

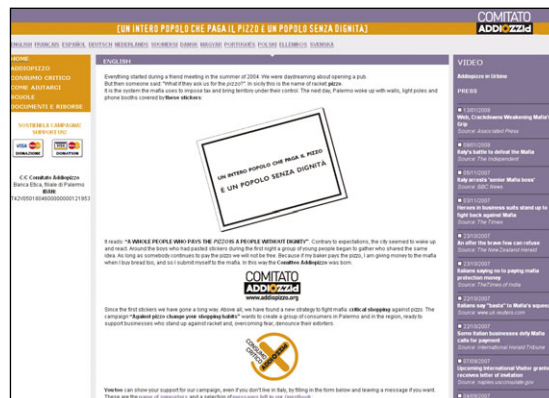
Is The Pirate Bay Unsinkable?

Peter Kolmisoppi, one of four captains sailing BitTorrent-tracking site The Pirate Bay, said in early February the site's operators have stretched the site's servers globally out of reach of Swedish officials. "The Pirate Bay is not in Sweden," Kolmisoppi said. A Swedish prosecutor previously charged the foursome with violating copyright law, and in February, a Danish court ordered Denmark ISP Tele2 to block access to the site upon a request from the International Federation of the Phonographic Industry. Still, The Pirate Bay continues to sail its flag high, claiming in its 100th blog post it's "tracking over 1 million torrents," has had "over 10 million simultaneous peers," and has "2.5 million registered users." Argggh. ▲



Tough Times For Gangstas

Think it's easy being "connected" in the digital age? Think again. Thanks to Addiopizzo.org, mobsters are finding it more difficult squeezing protection money out of Sicilian business owners. Addiopizzo.org began after several friends considered opening a pub in 2004, only to naturally ask themselves, "What if they ask us for the pizzo?"—pizzo being protection money. After forming the Committee Addiopizzo and slathering Palermo, Sicily, with fliers reading, "An Entire People Who Pays The Pizzo Is A People Without Dignity," the committee went online "to create a group of consumers in Palermo and in the region, ready to support businesses who stand up against racket and, overcoming fear, denounce their extorters." Hmm, an offer a business owner can't refuse. ▲



Americans Abroad Rock The Online Vote

As Super Tuesday came and went, Americans overseas (reportedly 6 million strong) cast absentee ballots around the world, including in Indonesia, where presidential hopeful Barack Obama lived as a boy. In addition to voting in person, via fax, and snail mail, Democrats overseas voted online for the first time ever via Democrats Abroad, an official branch of the Democratic Party holding voting in 33 countries. Unfortunately for Republicans, the overseas online option wasn't available, as Republicans Abroad operates independently of the Republican Party and can't hold in-person or Internet voting abroad. ▲

Site Seeing

Gentlemen, Place Your Bets

If you're the type who scans CNN.com while playing online poker, Hubdub.com is for you. Instead of Texas hold 'em, however, bets center on the outcomes of real news stories in such categories as Technology ("Will Google make an offer for Yahoo! to challenge Microsoft's bid?"), Business, Politics, Sports, and Entertainment. There's one catch, though: Bets are placed using Hubdub dollars, not actual currency. You get 1,000 Hubdubs upon registration and 20 each day you log in. A fantasy sports-type model is reportedly being considered that might involve awarding a lump cash sum to winners, but for now, Hubdub.com is all about maintaining your know-it-all status. ▲

Get A Notch Up At NotchUp.com

The premise at NotchUp.com is simple: Companies pay *you* for the honor of interviewing you for potential employment. Why? NotchUp.com says, "It's faster AND less expensive for a company to pay candidates for interview than it is to pay a recruiter 10 to 30% of the candidate's salary or to post jobs, then sit back and wait for the perfect candidate to come along." Though still in beta, NotchUp.com counts Google and Yahoo! among customers. Registration is free, but there's a pre-screening process based on fairly stringent academic and past employment qualifications. If you're accepted, interested companies will request an interview, after which NotchUp.com cuts you a check or credits your PayPal account. ▲

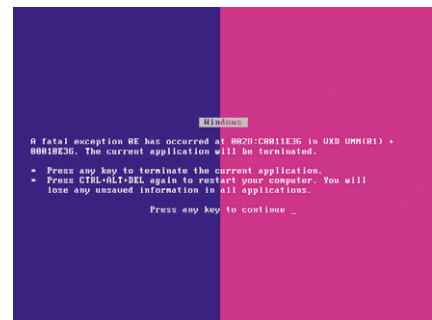
Flickr Users Close Their Shutters To Microsoft

Google execs weren't the only ones voicing objections to Microsoft's \$44.6 billion rejected takeover bid of Yahoo! in February. A group of Flickr users reportedly numbering several thousand strong were also up in arms over the power play. The group's Microsoft: Keep Your Evil Grubby Hands Off Our Flickr campaign ("We, the undersigned, wish you would just leave Flickr alone. OK?") stems, of course, from the fact that Yahoo! owns the photo-sharing site. Signs of protest included wickedly creative mashed-up photos from the Flickrers aimed at Steve Ballmer and company. ▲



More Love For The Mac

Count Google and Crucial among those cozying up to Apple, software-wise. Crucial's newly released System Scanner tool scans Mac desktops and notebooks, compiles component information, and delivers potential memory upgrades. Crucial says the tool is the "first online tool from a memory manufacturer to provide a self-help scanning instrument exclusively for Mac users." Meanwhile, Google's recent Toolbox for Mac is a "collection of source from different Google projects that may be of use to developers working other Mac projects." Elsewhere, a rumored version of IBM's Lotus Notes for the iPhone didn't materialize in mid-January as some reports suggested it would. An IBM spokesman did reportedly say, "It's not something that (is) ready to go out and market or launch." So, there's still hope. ▲



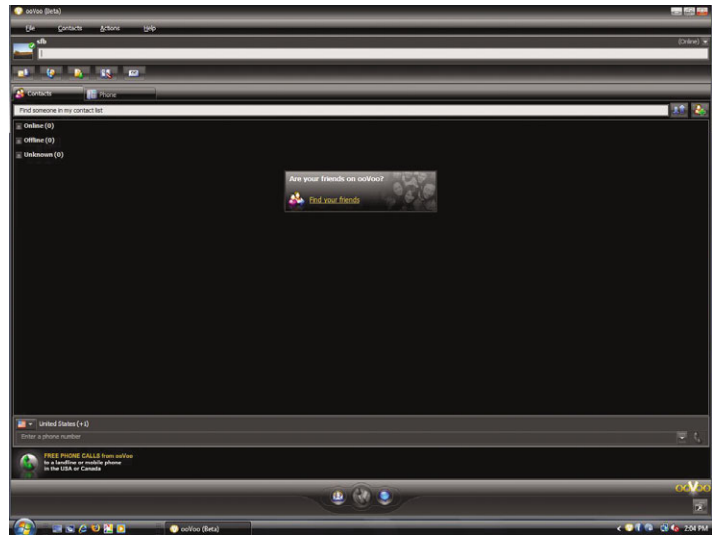
Equal Opportunity Hacking At CanSecWest?

If you're heading to Vancouver in March for the ninth annual CanSecWest conference, bring along your Linux and Vista hacking skills. According to organizer Dragos Ruiu, CanSecWest officials are contemplating broadening the hack-a-Mac contest they ran last year to include Linux and Vista machines to "see which one goes first." In 2007, researcher Dino Dai Zovi discovered a QuickTime flaw that let him run unauthorized software on a Mac OS X system, which netted him a MacBook Pro and \$10,000 in exchange for providing 3Com's Tipping Point details of the bug. If the three-hack attack doesn't materialize, it may be because Ruiu has hinted he's considering a different, top-secret contest instead. ▲

Software Shorts

ooVoo Gives New Vision To Video Chat

Look out, Skype; ooVoo is hot on your trail. Although still in beta, the free ooVoo continued to add goodies to its already impressively handsome video chat app in early February with its 1.5 release. Among new features are free calls to landline and mobile phones, video effects, a new Sidebar view, importing contacts, and the ability to record chats to AVI, FLV, or HTML files. Six-person chats are also supported, as are Mac systems, although Linux rigs are out for now. Further, ooVoo doesn't use your system as a node to help out those with less-stealthy rigs. ▲



Who needs Skype when you can ooVoo instead? The beta version released in February lets you make free calls to landline phones and adds a slew of other features.

Gartner Predicts Happy Times For Open Source

Research firm Gartner looked into its crystal ball recently and made 10 predictions concerning events and developments relating to IT and business, including that “by 2012, 80% of all commercial software will include elements of open-source technology.” This forecast is based on open-source technologies being “mature, stable, and well-supported” and open-source software providing “significant opportunities for vendors and users to lower their total cost of ownership and increase returns on investment.” Elsewhere, Gartner predicts by 2012 at least one-third of business application software spending will be software-as-a-service-related rather than product licensing. ▲

Does Google's 20-Year Pledge Add Up?

Maybe it's us, but Google Chairman Eric Schmidt's recent admission that he and Google co-founders Larry Page and Sergey Brin pledged shortly before the company went public in 2004 to work together for 20 years seems a bit shoddy if allegations from Brian Reid, former director of operations and engineering, are true. The California Supreme Court recently ruled it would consider Reid's 2004 lawsuit against Google, in which Reid, now 58, says he was fired due to his age. He also claims colleagues routinely called him “old man” and “fuddy-duddy,” and only 2% of Google's employees in 2004 were 40 or older. By the way, Schmidt will reportedly be 69, Page 51, and Brin 50 when those 20 years expire. ▲

BIOS Upgrades Available Online Compiled by Steve Smith

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new lease on life. Here are a few recently released upgrades. Readers can check out www.cpumag.com/cpuapr08/bios to see our entire upgrade list.

Motherboard	Date Available	URL
ASRock AM2NF3-VSTA 2.40	1/15/2008	download.asrock.com/bios/AM2/AM2NF3-VSTA(2.40).zip
Asus Maximus Formula 0907	12/18/2008	dlsvr03.asus.com/pub/ASUS/mb/socket775/Maximus_Formula/MF0907.zip
Biostar NF61S Micro AM2 SE 6.x N61sma18	10/30/2007	www.biostar.com.tw/upload/Bios/N61sma18.bfa
ECS P33T-A 07/12/26	12/26/2007	www.ecs.com.tw/ECSWebSite/Downloads/DownloadFile.aspx?catid=1&driverid=4015&areaid=2&LanID=9
Gigabyte GA-M52S-S3P (re. 2.0) FC	12/04/2007	america.giga-byte.com/FileList/BIOS/motherboard_bios_ga-m52s-s3p_2.0_fc.exe
Shuttle SN68PTG6 Deluxe SN68SPOI	1/24/2008	global.shuttle.com/servlets/download?file_id=10777
Supermicro PDSBA+ 1.0c	11/12/2007	www.supermicro.com/support/bios/bios_zip/DSBAB097.zip

Compiled by Steve Smith

The Job Search

It's spring, and love is in the air. Even IT types can do their part to program Cupid's arrow. At eHarmony, for instance, you can be a Release Engineer and Manager, the go-to person for the date-making company's custom-built applications. You own the release process by writing deployment scripts, launching the new apps, and applying the inevitable patches. You'll manage over 100 servers that are dedicated to finding that special someone. This Cupid's quiver must include a strong background in WebLogic, RedHat Linux, and Apache, which we guess is more romantic than it sounds.

jobs-eharmony.icims.com/eharmony_jobs/jobs/candidate/job.jsp?jobid=1078&mode=view

If you're more the SQL Server type who really gets turned on by troubleshooting databases (and who doesn't?), then Match.com is looking for an SQL Database Engineer. Given the millions of love-seekers at Match.com, we have to imagine that running solutions that address the company's business needs is no small task. You'll need five years of experience with database design and a track record maintaining 24/7 Web environments that (we guess) tend to get hit hard by lonely hearts on those dateless Friday nights.

jobsearch.iac-careers.com/getjob.asp?jobID=67334204&AVSDM=2008%2D01%2D16+13%3A11%3A22&Logo=0&col=dtcl&co=xwmvx,xwmvctx&sort=dt&vw=b



-1.14%
Percent
decrease in
active
Internet
users in
the UK in
2007
(Nielsen)

50%
Percent
of U.S.
homes
with a
digital
TV set
(CEA)

24%
PERCENT OF
AMERICANS
WHO HAVE
NO
INTERNET
ACCESS
(PEW)

-9.5%
Percent
decline in
music
album
sales in
2007
(SoundScan)

Hooray For Digital TV! What Is It?

The Federal Communications Commission mandates that on Feb. 17, 2009, TV broadcasters must stop sending over-the-air analog signals and convert entirely to digital. For roughly 80% of users who already get their TV service over cable or satellite, the switch means no change in service, but 20% of U.S. homes that rely on over-the-air reception could go TV-less if they don't get up-to-speed. According to a CTAM Pulse survey, only 31% of the 19 million analog-only TV households, the ones most affected by the big switchover, are aware it is occurring.
www.tmcnet.com/usubmit/2007/12/10/3153273.htm

Not There Yet: Monthly Mobile Content Consumption

For all the hype about the rise of the mobile Web, music, and commerce, a relatively modest percentage of Americans use their phones for more than talking and texting.

Watched Video	4.2%
Listened To Music	5.7%
Used Web Browser	12.6%
Saw SMS Ads	20.6%
Played Downloaded Game	9.1%
Used Downloaded Application	4.2%
Sent/Received Photos/Videos	20.5%
Purchased Ringtones	9.7%
Used Email	11.6%
Used Social Networking Sites	3.6%

Source: M:Metrics
(Three-month average ending November 2007)



**What do ambitious
Web engineers do
with too much time
on their hands?**

on their hands?
with too much time
Web engineers do
What do ambitious

They develop the world's best free webmail service GMX – Global Mail X-change.

- ✓ Already over 10,000,000 satisfied users and counting!
- ✓ Huge selection of available names with gmx.us or gmx.com!
- ✓ Unprecedented spam protection. Up to 98 % hit rate.
- ✓ Maximum virus protection guaranteed!
- ✓ Bundle your existing e-mail accounts & addresses into one!

Why our engineers believe GMX is the world's best webmail service:

- Professional tools for maximum protection from viruses
- 7-fold anti-spam measures for up to 98 % fewer unwanted e-mails



- Mail addresses to match your needs: Select your favorite name from a huge selection of available addresses ending in gmx.us or gmx.com!
- You can even continue using your existing e-mail addresses with the GMX Mail Collector (e. g. Google, Yahoo!, Hotmail etc.) and easily manage them all from one platform.



- State-of-the-art, high security servers hosted in the USA
- Over 99 % guaranteed availability
- 5 GB storage space
- Up to 50 MB attachments per mail
- POP3 & IMAP supported



GMX Internet Services Inc. is a subsidiary of United Internet, a listed company with a market capitalization of 5 bn US \$ and over 3,500 employees. GMX has over 10,000,000 enthusiastic users and thousands more are joining every day.

Free webmail service and call it



The screenshot displays the GMX webmail interface. On the left is a sidebar with navigation links: GMX Mail, Inbox (6), College, Newsletter (3), Private, Sports (1), Work, Spam, Drafts, Sent, and Trash. Below these are links for John.Doe755@yahoo.com, JRandom9@aol.com (2), Basketball.Club@gmail.com, and Jdactive@hotmail.com. The main area shows an inbox for Basketball.Club@gmail.com with columns for From, Subject, Size, and Date. A message from Kevin Smith is selected, showing its content: "Hi John, I wanted to let you know that we changed our weekly gym training to Thursday nights. Meet us in front of the courts to start warming up at 7:30 - please be on time. If we want to win next month's tournament, we really need to focus and work hard. If you can't make it, let me know by calling my cell. Thanks, Mark". To the right, a list of messages is shown with columns for Size and Date. A "Full Screen" button is visible below the list.

Size	Date
325 KB	10.34 a.m.
116 KB	11:11 a.m.
334 KB	11:18 a.m.
325 KB	11:40 a.m.
49 MB	11:52 a.m.
334 KB	01:41 p.m.
325 KB	02:08 p.m.
116 KB	09/26/07
334 KB	09/26/07

Full Screen
09/28/07 11:11 a.m.

it a lot. tached! lunch. Friday.

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A Tale Of Two Kings

Once upon a time, there were two proud, powerful, and impatient kings. Each lived in a great castle atop a high mountain separated by a vast valley where the common folk who lived in their two kingdoms farmed and prospered. The two kings, King CPU and King GPU, had much in common, foremost of which was a great love for the game of chess. Being proud, however, each king was unwilling to leave the lavish fortifications of his castle to make the arduous 32-day journey from one mountaintop to visit the other. As such, the kings each appointed a servant from the village below to act as a messenger between their kingdoms, enabling them to play chess without leaving the comfort of their throne rooms.

Thus it was that a chess board was set up in the hall of each king, and a third chess board established in the village square between their mountains. When it was King CPU's turn, he would make a move on the chessboard in his throne room. His dutiful servant would memorize the move and set off down the mountain to the village below where he would meet King GPU's servant to duplicate the king's move on the common chess board in the square. Then King GPU's servant would memorize the move and set off on the long journey up the opposite mountainside to return after many days to the hall of King GPU, where, weary with exhaustion from the long climb, he would duplicate King CPU's move on King GPU's chess board.

The brilliant King GPU barely needed to glance at the board before moving, and without giving his servant a moment of rest, sent him on his way back down the mountain to the village. In this fashion, the kings played chess, each taking a turn once every 64 days as their servants conveyed their moves up and down the steep mountain.

Being wholly obsessed with their games, the kings had little to occupy them in the intervening days between moves and constantly demanded that their messengers move faster. After many years of this, King CPU finally lost patience and demanded that his wise men think of a faster way for him to play chess with King GPU. After many days of careful consideration, his advisers proposed a solution to the problem. The wisest of them, whose name was Intel, came to the king and said, "Oh King CPU, we propose to remedy this great inefficiency by establishing not one but 32 chess boards in the great halls of your castles and another 32 chess boards in the village square. We shall call the chess boards in your hall "L1 cache" and the chess boards in town "main memory." Thirty-two servants from each kingdom shall be appointed to convey your moves from each of 32 concurrent chess games. Every other day you shall make one move for one of the 32 games you are playing, and King GPU shall make one move in his court. Although your respective servants will still take 32 days to convey a move, you shall be able to take a turn every other day!"

"Bravo!" said King CPU, and granted Intel vast lands and titles in reward for this ingenious solution to his problem. And for a time, the king was happy, for he was now able to play chess with King GPU 32 times faster, although the rulers had to conscript 64 additional villagers to become messengers for the new scheme.

Before long, however, the luxury of getting to spend a few seconds every other day making a single chess move wore off, and King CPU's patience was again strained. Again he summoned his wise men and asked for a speedier way to play. "Oh King," said Intel, the wisest among them, "in our labor to design a more efficient way for you to play chess, we have noticed that there are two stages in the journey from the village to your court. The first is a long, slow climb up and down a sheer mountainside and the second is the long walk from the foothills to the village square and back. We propose that you place 32 more chess boards, or an "L2 cache," at the base of each mountain."

"We will then increase the bus speed from the L2 cache to the L1 cache in your throne room by stuffing your messengers into barrels and pushing them off the mountaintop. They will land safely on a pile of hay at the bottom of the mountain and will convey your moves to the L2 chess boards, where other messengers will memorize them and ride on horseback to the village to again copy the move to the appropriate boards in the village square. From there, King GPU's horsemen carry their moves to the foothills of his mountain and pass them off to another group of messengers, who will in turn be fired from cannons to the entrance of King GPU's castle. We will, of course, need to conscript another 64 villagers for this to work, but we calculate that it will improve performance 48 times, thereby enabling you to make a chess move every hour instead of once every other day!"

"Bravo!" said King CPU, and rewarded Intel with more land and titles. Soon the king was able to play chess for a few seconds once an hour as one bedraggled messenger after another arrived exhausted, singed, and smelling of gunpowder with a new chess move from King GPU. For a brief time, the king's hunger for chess was sated, but soon the hour he spent admiring the vast Vista from his throne room between moves grew tedious. For although watching it consumed all of his free time, it was neither entertaining nor the least bit productive.

Frustrated, the king again summoned his wise men and demanded a way to devote all his free time to the game he loved. "Oh King," Intel began, "I believe I have found a solution that will solve your problem once and for all."

"Do tell," replied the king.

"It will require a lot more villagers . . ." said Intel.

"Still listening," said the king.

"Instead of using 32 chess boards at each cache level, we'll use 64."

"Why not more?" asked the king.

The wise man shrugged. "Let's make it 256, then; we'll add an 'L3 cache' between the horsemen and the village made up of archers who will take the moves from the messengers dropped off the mountain in barrels, tie them to arrows and fire them at the horsemen, who will have hay-stuffed bull's-eyes on their backs."

"I like it!" said the king.

"But wait, there's more," said Intel. "Instead of just deciding on one move for each chess game, you will consider all possible responses that King GPU could make to your moves and provide responses for

all of those, then anticipate his possible responses to those moves and respond to them, as well. It will take thousands of messengers for each move because they're not very bright and each can remember only one move. But in this fashion, you will not only be able to make more moves, but you'll be able to spend more time calculating all possible responses to them instead of waiting idle for the next messenger."

"Let's do it!" said the king, and again rewarded the wise Intel with more lands and titles for his genius.

Now it came to pass that all of the kings' subjects were conscripted into service to deliver messages between them, and all commerce and farming in the kingdoms came to a halt. All their resources were devoted to playing chess, but the kings were finally able to play chess with only a few minutes of wasted time between moves and could spend these moments anticipating future possible moves and responding to them.

The villagers, of course, were starving, exhausted, and close to rebellion, but this was a small concern compared to the great satisfaction the kings derived from being nearly able to satisfy their all-consuming passion for chess. Since the kingdoms no longer produced their own food, the kings' coffers were rapidly expended importing all the food from the power supply required to feed all the messengers. This too was of little concern to the kings, but the wise men saw the empires declining and came once more to King CPU's throne. "Oh King, we have a problem," their wise spokesman said.

"Oh?" replied the king, "How so?"

"Your empires are in decline, there is unrest among the villagers, and still your appetite for chess is not fulfilled. This cannot continue, your majesty."

"What do you propose?" asked the king.

"All our new ideas require more villagers, but there are no more to be found except this fat, lazy one we found drunk in your larder." With that, the wise men dragged a corpulent peasant into the court and cast him sprawling on his belly before the king.

"What is this?!" demanded the king, rising to his feet. "Why are you not at work accelerating my game of chess?"

The drunkard staggered to his feet and, swaying biliously, said, "There's no point, majesty. How can I make a difference in your game?"

"He has a point," said the king. "Execute him!"

"Wait!" shrieked the drunk as the guards seized him. "I have an idea!"

"This had better be good," growled the king.

"You have a son, yes? And King GPU has a daughter? Marry your heir to GPU's daughter, unite the kingdoms, abdicate your respective

thrones to your son, and retire to play chess together any damn place you please."

The king's jaw dropped, and a hush fell across the court. The wise men stared wide-eyed in shock, and the flurry of messengers cramming the hall delivering chess moves came to a stunned halt. After a long silence, the king exhaled a long breath and said, "That's not the craziest thing we've tried . . . release him!"

King GPU arrived in King CPU's court 64 days later to attend the wedding of his daughter to CPU's son. The prince was crowned king, and the two great rulers retired to play chess as fast as they wanted. The villagers celebrated, then returned to their homes and fields.

The only ones who were unhappy with this outcome were the wise men, who no longer had any problems to solve. One day, the wisest of them interrupted the two retired kings as they furiously traded moves, having gone without sleep or food for several days. "Oh great kings, I have an idea." The kings paused to listen.

"Imagine how much more chess could be played if we were to crown four or even 16 more kings to play chess with each other simultaneously!"

At this, King GPU rolled his eyes, but King CPU shrugged and said; "What the hell, let's do it! Why don't we rename the kingdom Fusion while we're at it!"

"I was thinking maybe Nehalem," said the wise man.

"That's a stupid name," replied the king. "You're fired. Somebody go find that fat peasant and give him all this guy's stuff!"

The End ▲



Alex St. John was one of the founding creators of Microsoft's DirectX technology. He is the subject of the book "Renegades of the Empire" about the creation of DirectX and Chromeffects, an early effort by Microsoft to create a multimedia browser. Today Alex is president and CEO of WildTangent Inc., a technology company devoted to delivering CD-ROM-quality entertainment content over the Web.

Send your feedback to
thesaint@cpumag.com

DREAM HARDWARE

These Gizmos Don't Sing It, They Bring It



Freudians are having a heyday with this month's Dream Hardware. With everything getting so much bigger, taller, and wider, it's small wonder that nothing else measures up.

by Marty Sems

Panasonic Lifescreen 150-inch

Well, you saw this coming. Right up our alley here at Dream Hardware is this 11- x 6.25-foot mammoth, the world's largest flat-panel HDTV. Striking a blow for plasma technology in a much more daunting way than Pioneer's exquisite KURO could, this "quad-1080" prototype addresses 4,096 x 2,160 pixels for an impressive level of detail (www.panasonic.com). Mass production should start in late 2009, when a new factory being built specifically for the purpose is completed. Predictably, Panasonic says that the Lifescreen will assail the commercial and digital cinema ramparts before lumbering into (rather affluent) homes. The company won't even hint at a suggestion of an apocryphal guess at what the price will be. Prepare to see lots of zeroes in it.

Wisdom Audio Infinite Wisdom Grande

While we're on the subject of *grande*, let's pair our 150-inch plasma with speakers guaranteed to dwarf it. Sit and listen to infinite wisdom, writ large (surf to www.wisdomaudio.com/home.html to bypass the limited-function storefront). The low-frequency assemblies alone would scrape most home ceilings at 8 feet tall, but try to wrap your mind around planar-magnetic arrays that tower 13 feet above the floor. This low-distortion Stonehenge can push 120dB of sound pressure when driven to it. Enlightenment isn't cheap—\$700,000 for the set—but whoever said it should be free? (Just ask Tom Cruise. OK, that was a cheap shot.) More recently, Wisdom announced the new Sage series of in-wall speakers, priced at up to \$16,000 per pair. Talk about smart money.

Alienware Curved Monitor

Do real gamers have curves? Call this one a fascinating forerunner of awesome things to come. Race gamers, flight simmers, and a few diehard FPSers have long salivated over triple-head monitor setups. Alienware and manufacturing partner Ostendo Technologies showed off a "very advanced prototype" of a DLP/LED display that aims to change all that. The Curved Monitor (model CRVD-42DWX+) spans 42.4 inches in a wraparound, double-widescreen view and supports a 2,880 x 900 resolution over one dual-link DVI cable. The 900-pixel screen height doesn't exactly sound impressive by PC gamer standards, although it does fall smack-dab between the 720 and 1080 high-def standards' vertical heights. Alienware lists the display's aspect ratio as 3.2:1, or 16:5 in more common parlance. The company tells us not to worry about game support for the ultra-wide resolution. That said, all we've seen running thus far has been *Crysis*, and we were jet-lagged at the time. In any case, Alienware doesn't expect to even estimate a price until the middle of the year. ▲

PSU Showdown

Six Powerful Power Supplies Put To The Test

When the time comes to purchase a new power supply, many users simply head right to their favorite retailer and grab the highest-wattage PSU they can find that also happens to fit their budget. Unfortunately, there are no set standards that all PSU manufacturers must adhere to, so one company's 1,000-watt unit may be another's 700-watt product—and that's if either is able to hit its reported output ratings at all. Even worse, some less than scrupulous companies report peak or continuous wattage ratings using data gathered in unrealistic testing conditions that will never occur in the real world.

There are a lot of things to be aware of when shopping for a PSU, but no hard-and-fast rules that universally apply to all power supplies that will help you pick out a high-quality unit in a sea of mediocre offerings. If you have physical access to the units, though, higher-quality power supplies are typically heavier than cheap units. Additionally, the enclosures won't be flimsy, the cables will be heavier, connectors will be tight, and any sheathing will be installed properly. High-quality units will typically have better finishes, as well.

In the May 2007 issue of *CPU*, we printed a large PSU roundup and discussed the principles behind PSU design and selection. (See pages 58 to 73.) The information in that article explained what makes one power supply better than another and how to determine which PSU is right for a particular build. If you haven't already read the article, we suggest going back and taking a look.

Some time has passed since that article, so we thought it was time to test a few more high-end units to see which deserve your hard-earned dollars. We collected units ranging from a "meager" 720



Turbo-Cool 1200

\$499.99

PC Power & Cooling

www.pcpower.com



watts to a whopping 1,600 watts and tortured them with a powerful system that's capable of using more juice than just about any typical PC.

How We Tested

In lieu of specialized, ultra-expensive, thermally controlled test equipment, we decided to test the half-dozen PSUs in this roundup in a real-world scenario using a system built from off-the-shelf components. Of course, we used nothing but the most powerful parts: a pair of quad-core Intel Xeon 5365 processors, a workstation-class Intel S5000XVN motherboard, 4GB of FB-DIMM memory, an AMD Radeon HD 3870 X2, an X-Fi sound card, an AVerMedia TV tuner card, a BFG PhysX card, two optical drives, and three hard drives—all stuffed into a Gigabyte 3D Aurora case. If a PSU can handle a machine of this caliber, we figured it would no doubt be sufficient for even the most powerful single-CPU machine.

To put a heavy load on the power supplies while they were installed in the test system, we simultaneously looped SiSoft Sandra's multithreaded Processor Arithmetic benchmark, played a CD, watched

TV in a window, ran the rthdribl (Real-Time High Dynamic Range Image-Based Lighting) graphics demo, and defragged a hard drive. In this scenario, our behemoth test machine consumed over 700 watts sustained. We left the power supplies to handle the load for hours on end.

PC Power & Cooling Turbo-Cool 1200

The massive Turbo-Cool 1200 is PC Power & Cooling's current flagship PSU. As is the case with all of PCP&C's high-end PSUs, the Turbo-Cool 1200 utilizes a powerful single-rail design, which, in this case, is capable of continuously supplying 90A over its 12V rail, peaking at 115A. And according to PC Power & Cooling, the Turbo-Cool 1200 has an average 83% efficiency rating and a 0.98 Active PFC rating.

We found the Turbo-Cool 1200 to have very stable voltage output that did not fluctuate during periods of heavy load. And because this PSU is geared toward the high end, it's outfitted with a multitude of connectors. We should also point out that even though the Turbo-Cool 1200 is Nvidia SLI

certified, it should have no trouble with Cross-Fire configurations, either.

True to PC Power & Cooling tradition, the Turbo-Cool 1200 includes the company's signature 14-point certified test report, so you know the unit you've purchased has already been tested for quality. This is certainly a nice touch because at about half a grand, the Turbo-Cool 1200 isn't so much a standard purchase as it is an investment. This PSU is built so well and provides so much power that it should last through multiple upgrade cycles and provide years of trouble-free service.

PC Power & Cooling Turbo-Cool 860

Although it comes from the same company and has the same industrial, matte-black finish, the Turbo-Cool 860 is cut from a different cloth than its



Turbo-Cool 860

\$269.99

PC Power & Cooling

www.pcpower.com



higher-powered, 1,200-watt counterpart. That's not to say the Turbo-Cool 860 is somehow inferior. This unit is just different in a number of ways. First of all, the Turbo-Cool 860 is physically much smaller than the 1,200-watt model. The 860 is only about 7.5 inches long, which is more in line with a standard ATX PSU. As for its specifications, the Turbo-Cool 860 sports a slightly

better 84% average efficiency rating and a 0.985 PFC. The Turbo-Cool 860's complement of connectors isn't quite as over the top as the 1200's, with fewer PCI-E and motherboard power connectors, but it's still very well appointed. And like the Turbo-Cool 1200, the 860 is SLI certified.

Another feature that sets the Turbo-Cool 860 apart from its higher-powered

The Limits Of PC Power

With the pace at which PSU manufacturers have been increasing the output and efficiency of their power supplies over the last couple of years, it would be easy to assume that there's no limit to what they can do. But there are insurmountable obstacles that cannot be avoided, at least not without making major changes to a home's electrical system. You see, in a typical electric circuit in a home, the circuit breakers, wiring, and outlets used are usually rated for either 20A or, more commonly, 15A. If you use the simple formula Volts * Amps = Power, that means a 15A circuit can safely supply no more than 1,725VA (volt amps) through the whole circuit with the 115V supplied by the electrical grid.

To get more insight into the practical limits that power supply manufacturers have to endure, we talked with Enermax's Joerg Theissen. "From our understanding of legal requirements in the United States per the National Electric Code, section 210-12 of the 1999 edition states that new house bedrooms built after Jan. 1, 2002, shall be protected by an arc breaker with a trigger point that is usually 15A or 20A," Theissen says.

As we've already mentioned, because the voltage from the grid is 115V, there is a maximum current limit of 1,725VA for 15A circuits and 2,300VA for 20A circuits. But there's more to contend with than just this limitation. A typical PC has to share the power on the circuit with other devices in the room, such as lighting, not to mention the PC's monitor and other peripherals.

If the total power consumption on a circuit protected by an arc breaker exceeds its rated limit, the arc breaker will be triggered, which cuts off the power. This has happened to all of us at one point or another when the power goes out after we turn on too many devices in a room. With this limit in mind, Theissen also has strong opinions on how PC power supplies should be designed. "Due to the fact that the

1,725VA are used to power not only the PC itself but also the other devices plugged in to the circuit, a PC's power supply should not be designed to consume up to 1,725VA," he says.

Theissen adds, "This alone cannot prevent shutdowns, as they are triggered by the total power consumption of all devices connected to a respective arc breaker, but Enermax has set for itself a self-limitation of ~1,500VA to ensure our customers can fully use our products without issues." A 1,500VA limit for a PSU results in an effective maximum wattage of about 1,200 watts. For example, a 1,200-watt PSU with an efficiency of 80% and a PFC of 0.99 at full load would draw just over 1,515VA (1,200 / 0.8 / 0.99). This is the reason Enermax believes 1,200W as the reasonable limit for a desktop system's PSU.

In a best-case scenario, a PC in a room with a dedicated 20A circuit with no other devices connected—including a monitor—could have an 1,800-watt PSU, which would draw about 2,273VA (1,800 / 0.8 / 0.99) at full load. According to Theissen, power supplies with higher outputs should not be deemed safe for home use.

Should the power requirements of desktop computer systems continue to increase, there are some things that could be done to somewhat extend the above limits, but none of them are very practical. For one, dedicated 20A circuits could be set up in a home for just the computer, similar to what's done for many air conditioning units today. Or, PCs could feature multiple power supplies, and each one could connect to its own dedicated circuit. Switching to high-current 220V circuits could also help, but none of this could be done without overhauling a home's electrical wiring. Thankfully, all of the major semiconductor manufacturers have begun to focus on energy efficiency and performance per watt, and we doubt even the most hardcore power user will need a PSU larger than 1,200 watts. ▲

counterpart (and all of the other PSUs in this roundup, for that matter) is its adjustable +3.3V, +5V, and +12V rails. The Turbo-Cool 860 features a trio of adjustable potentiometers that can be used to increase (or decrease) the output of the rails for fine-tuning performance. This is a feature that is guaranteed to please hardcore overclockers with the courage to pump tons of voltage into their components.

With its relatively high output rating, high efficiency, quality construction, and adjustable rails, it's easy to like the Turbo-Cool 860. Considering its features, performance, and competitive price, this has to be our favorite PSU of the bunch (although we wouldn't mind if PC Power & Cooling offered a quieter cooling fan in a future revision).

Ultra Products X3 1600-Watt Energy Efficient Modular Power Supply

Ultra claims the title of "World's Highest Advertised Output" for a desktop PSU with its monstrous, 1,600-watt X3. This beast of a PSU is physically about the same size as the Turbo-Cool 1200, but unlike PC Power & Cooling's offerings, the X3 1600 features a modular cable configuration. Even the 24-pin ATX power cable can be removed. In addition, the X3 1600 features Ultra's FlexForce cables, which are much easier to manage than typical, stiff PSU cables. Ultra's FlexForce cables are much more pliable than most PSU cables, and the individual wires are bonded together, which made routing them neatly through-out a case much easier for us.

Ultra claims the X3 1600 is 80% efficient, although the test data on the company's Web site suggests an average of 77 to 79% efficiency is more accurate: The X3 1600 only achieved its 80% efficiency at 800 watts, half its advertised peak capacity.

A particularly nice feature of the X3 1600 is its oversized, 135mm cooling fan. During testing, we found that the unit's cooling fan moved a good amount of air, and this PSU was one of the quieter models we tested. If you crave the kind of output the X3 1600 offers but don't want to



X3 1600-Watt Energy Efficient Modular Power Supply

\$499.99

Ultra Products

www.ultraproducts.com



Galaxy DXX 850

\$299

Enermax

www.enermax.com



hear it working, you'll be pleased with this unit. We also found its voltage output to be very stable, and it had no trouble powering our beefy test system.

At about \$500, the Ultra X3 1600 isn't cheap, but you get what you pay for. This power supply is quiet, has modular cables, and is powerful enough to handle just about anything you can connect to it.

Enermax Galaxy DXX 850

At first glance, it's immediately evident that the Galaxy DXX 850 is geared for users of multiple graphics cards. This power supply features five 12V rails, with three 8-pin and five 6-pin PCI-E power connectors, which is more than enough for even the most demanding multi-GPU configurations. With this

setup, the Galaxy DXX 850 is both SLI and CrossFire certified, but Enermax brands the PSUs differently based on the certifications—the DXX 850 SLI and DXX 850 CrossFire, respectively.

Other than its smorgasbord of PCI-E power connectors, Enermax outfits the Galaxy DXX 850 with a multitude of drive and peripheral connectors but takes a conservative approach to the unit's modular cables. The main ATX power lead, other motherboard power leads, and a couple of the PCI-E power leads are hardwired to the unit; only a few PCI-E and drive/peripheral connections are modular. We're fine with this approach, however, because there's usually no need to remove those main power leads. The Galaxy DXX 850 also has a diagnostic LED that can alert users to potential problems.

The Enermax Galaxy DXX 850 was a solid performer throughout our testing. Its dual cooling fans were relatively quiet and unobtrusive, and its gloss-black finish

is downright gorgeous. And at \$299, it's priced competitively, too. This is a quality PSU that is certainly worthy of consideration for your next build.

Enermax Infiniti 720

Enermax's Infinity line of modular PSUs isn't quite as prestigious as the Galaxy line, but they are quality units nonetheless. And

Powerful Features & Specs

There's a lot of information to digest in this chart comparing the features and performance of all of the power supplies we tested. For the sake of clarity, we feel the need to explain some of the data. In the chart below, for example, if peak power data wasn't available for a particular unit, the continuous output rating was listed. We should also point out that although both Enermax power supplies are listed here as being SLI and CrossFire certified, there are sold as two different products in SLI and CrossFire editions. Finally, the "Cable Side" data point explains on which side of the PSU the main cable harness resides. A listing of "Motherboard" means the cables are closest to the motherboard side when the PSU is mounted in a typical tower case.

Our testing revealed some interesting data. Despite using the exact same hardware and software to test these power supplies, they all consumed different amounts of power according to a digital power meter. According to our meter, the Ultra X3 1600 pulled the most power from the outlet, hinting that it's slightly less efficient than the rest, while PC Power & Cooling's flagship used the least, a nod to its high efficiency. Also note that after being taxed for about 2.5 hours with a 741-watt load, the Kingwin unit failed and shut down, even though it was rated for 800 watts. The unit didn't completely die, and we were able to power the system back up, but it could not handle the load of our 8-core test system for an extended period of time. ▲

	PC Power & Cooling Turbo-Cool 1200	PC Power & Cooling Turbo-Cool 860	Ultra Products X3 1600 Watt	Enermax Galaxy DXX 850
Rated continuous (W)	1,200 (50 C)	860 (50 C)	1,600 (50 C)	850 (50 C)
Rated peak (W)	1,300 (50 C)	930 (50 C)	1,600 (50 C)	950 (50 C)
12V rails	1	1	1	5
+12V continuous (A)	90	64	117	24 (x5)
+5V continuous (A)	30	26	28	30
+3.3V continuous (A)	24	22	24	30
Manufacturer (per UL File #)	PC Power & Cooling	PC Power & Cooling	Andyson	Enermax
SLI certified	Yes	Yes	No	Yes
CrossFire certified	No	No	No	Yes
Max wattage tested	728	734	745	738
Case temp as tested	61 C	61 C	62 C	62 C
Power factor as tested	0.99	0.99	0.99	0.99
Efficiency rating (as advertised)	83%	84%	80%	80 to 85%
Modular cables	No	No	Yes	Yes
Cable side	Motherboard	Motherboard	Motherboard	Motherboard
Fan(s) location	Rear	Rear	Bottom, rear	Bottom, rear
Fans	80mm, 30 to 52 CFM, 32 to 44dB	80mm, 30 to 52 CFM, 32 to 44dB	135mm, 80mm (low noise)	135mm, 80mm; 20 to 30dB
Miscellaneous	Active PFC, ATX 12V 2.2, EPS 12V 2.91, RoHS	Active PFC, ATX 12V 2.2, EPS 12V 2.92, RoHS	Active PFC, ATX 12V 2.2, RoHS	Active PFC, ATX 12V 2.2, EPS12 v2.92, RoHS
PCI-E 8-pin	3	2	2	3
PCI-E 6-pin	3	2	4	5
Main 12V	24	24	20+4	24
8-pin EPS12V	2	1	1	2 (1 x 4+4)
4-pin 12V	1	1	1	3
SATA	6	6	10	18
Molex 4-pin peripheral	8	8	10	16
Floppy 4-pin	1	1	2	2
Finish	Matte black	Matte black	Gloss black	Gloss black
Length, including cable bend (in inches)	10.5	7.5	10.5	10
Warranty	7 years	7 years	Lifetime (with registration)	3 years
Price	\$499.99	\$269.99	\$499.99	\$299
CPU Rating	●●●●●	●●●●●	●●●●●	●●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

they have a couple of interesting features to boot. With its three 12V rails and 720-watt rating, the Enermax Infiniti 720 technically has the lowest output capacity of the units we tested. However, this unit passed our torture test with flying colors. In fact, even with our test machine sucking down almost 740 watts for several hours, the Infiniti 720 didn't falter once.

The Infiniti 720's 82 to 85% efficiency rating spans across 20 to 100% load conditions, so this PSU doesn't waste much energy during typical use. It also has a feature dubbed CoolGuard, which will run the PSU's cooling fan, and any system fans connected to the unit, for a few minutes after the system is shut down to eliminate residual heat.

It may not have a four-digit output rating, but the Enermax Infiniti 720 had no trouble powering our octo-core, dual-GPU test machine. If you don't have the funds for a 1,000-watt behemoth, this PSU should do the trick nicely.

Kingwin ABT-800MA1S

Although its reported maximum output of 800 watts put the Kingwin ABT-800MA1S a notch above Enermax's Infiniti 720 in terms of specifications, we had some issues with this power supply during testing. But first, let's talk about the unit's positives. The Kingwin ABT-800MA1S is an affordable, relatively high-output PSU costing about \$175. It also has a very large, quiet, 14mm

modular cabling system. The unit's modular cables screw in to threaded receptacles, which makes for a strong, solid connection. The ABT-800MA1S also has a nice black mirror finish.

Disappointingly, the unit couldn't handle the load our hefty test system put on it for extended periods of time. After about 2.5 hours with a consistent load exceeding 740 watts, our test system shut down. We could bring it back up, and everything worked properly, but the ABT-800MA1S couldn't handle the sustained workload. It seemed to function well during normal, day-to-day use. It should be capable of handling a fairly powerful system, just not one as over the top as ours. ▲

by Marco Chiappetta



Infiniti 720

\$199

Enermax

www.enermax.com



ABT-800MA1S

\$175

Kingwin

kingwin.com



Enermax Infiniti 720	Kingwin ABT-800MA1S
720 (40 C)	800 (50 C)
800 (40 C)	800 (50 C)
3	4
28 (x2), 30	18 (x2), 20, 24
30	32
25	24
AcBel Polytech	Super Flower
Yes	Yes
Yes	No
736	741 (Failed)
62 C	61 C
0.99	0.99
82 to 85%	>70%
Yes	Yes
Motherboard	Motherboard
Bottom	Bottom
135mm, 20 to 30dB	140mm
Active PFC, ATX 12V 2.2, EPS12 v2.92, RoHS	Active PFC, ATX 12V 2.2, EPS12 v2.91, RoHS
1	2
2	2
24	20+4
1 (4+4)	1
2	1
9	6
9	8
2 (using adapter)	1
Brushed pewter	Black mirror-like
7.5	7.5
3 years	1 year
\$199	\$175
●●●●●	●●

Supplemental Power Supply Units

Boost Your Juice With A Second PSU

Notebook PCs routinely outsell their desktop cousins these days, but desktops will always have one advantage. It's much easier for them to grow with your needs.

However, the more components you add, and the more powerful they are, the greater the possibility that your system's existing power supply unit may not be able to keep up with the additional demands. Extra hard drives and an auxiliary optical drive will add to the load, but their needs are fairly modest compared to, say, a screaming new quad-core CPU and a high-end graphics card. If you're moving up to an Nvidia SLI or ATI CrossFire configuration with two or more video cards (especially popular with gamers), your power requirements will spike dramatically upward.

If your current PSU can't hack it, you have two options: Replace it or share the load with a supplemental PSU. The latter option may be necessary due to space limitations or if your original PSU has a proprietary design. It may be the cheaper solution, too, especially if your old PSU has plenty of life left. By installing a supplemental PSU, you should be able to boost the total wattage available to your system for less than the cost of a new primary PSU.

We've rounded up five contenders for the job. All utilize the same basic design: Each unit fits into a spare 5.25-inch drive bay and draws AC power from a cable that slips through a PCI card slot in the back of the computer case. Another cable is used to sync operation with your main PSU, so the supplemental unit runs only when the computer does. Finally, internal cables deliver power to connected components; most of these units are solely intended to power graphics cards so your main PSU can breathe easier on everything else.

One warning: Supplemental PSUs require unobstructed airflow through the unit, so use caution when installing one in a case with doors or panels that block the drive bays. Unless you can leave the panel open, there could be a risk of overheating.

E-Power Technology EP-350 CD UNI Juice

The Juice Box juices your system with an extra 350W using a pair of +12V rails operating at up to 20 amps each. +12V rails are a PSU's most valuable players,



E-Power Technology EP-350 CD UNI Juice
Box | \$89 | www.epowertec.com



powering the system's high-demand components: the CPU and graphics cards, plus drives, fans, etc. When multiple rails are used, voltage is often divided between them, with each rail dedicated to specific connections.

For connectivity, the Juice Box employs a modular cable design, meaning you can use only what you need, rather than leave unused cables trailing to nowhere inside your case. Two pairs of PCI Express connections are available: 6-pin, as well as 6+2, whose cable plugs can be used as 8-pin connectors for newer, high-powered cards such as Quad SLI or split apart for 6-pin use.

A pair of blue LEDs located behind the faceplate will apprise you of operating status. Three fans (two in, one out) keep it running cool without generating undue noise. The internal power cables

are reassuringly thick, although their stiffness may prove hard to work with if you need to run them at tight angles.

If the 350W model falls short of your needs, E-Power also offers a 450W version for \$109.

FSP Group BoosterX 3

The SLI-certified BoosterX 3 can deliver up to 300W to two graphics cards. A single cable attaches to the rear and then splits in two, carrying 150W each, at up to 25 amps, to a pair of 6-pin PCI Express connections. If you need to power



FSP Group BoosterX 3
\$89.99 | www.fspgroupusa.com



only one card, there's no way to detach the unused cable.

The X3 has better-than-average efficiency of 85%, with very stable current and performance. For cooling, it uses two fans (both intake), which can get noisy when the unit is pushed, but not so bad that a reasonably loud game can't drown it out.

If you need still more power than the BoosterX 3 delivers, the 450W BoosterX 5 is scheduled for release in spring 2008 for \$99.99.

Spire NitroPower VGA Booster SPVGA-450W

As we go to press, the NitroPower hasn't yet been released, so we weren't able to test it first-hand. But it should be out by the time you're reading this, and based on the information we have, it's certainly worth a look.



Spire NitroPower VGA Booster SPVGA-450W
\$79.99 | spirecoolers.com



Thermaltake Purepower Power Express
\$49.99 | thermaltakeusa.com



Ultra Products Power Partner
\$89.99 | www.ultraproducts.com



The model number and the marketing material we've seen imply that this is a 450W PSU. However, that spec is actually peak power—the maximum wattage a unit can deliver for short periods of heavy demand. The NitroPower's continuous power—what a PSU can consistently deliver under normal load conditions—is 320W, coming from two +12V rails at up to 20 amps. Heat shouldn't be a problem, with 85% efficiency and three cooling fans (two in, one out).

The NitroPower uses modular cabling, with dual 8-pin Quad SLI connections and dual 6-pin PCI Express connections. It also features the most informative status display in the bunch, with six blue LEDs, one for each outgoing line, as well as the incoming AC and the 4-pin Molex connection that syncs with the main PSU.

Thermaltake Purepower Power Express

Technically, there are two versions of this unit: #W0099RU, which is certified

for Nvidia SLI, and #W0130RU, certified for ATI CrossFire. What's the difference? Not a thing, other than their chassis colors (black for the SLI unit and silver for the Crossfire, with the same black faceplate on each). According to Thermaltake, Nvidia simply requires a different part number for marketing purposes.

Either way, it adds 250W from dual +12V rails at up to 21 amps. You can power one or two cards from a pair of 6-pin PCI Express connections. It uses a single fan but runs cool and quiet. Two LEDs display the status of the outputs.

For synchronizing with the main PSU, the Power Express uses a 24-pin motherboard connector. In some cases—and this can happen with any supplemental PSU—some peculiar voodoo may prevent the secondary unit from powering on and off with the main PSU. In case it's necessary, the Power Express has the simplest alternative: a rocker switch on the front panel.

The Power Express was introduced in 2006 and thus is among the oldest units

here, so it may be underpowered for the latest bleeding-edge cards. But it's easily our lowest-priced unit, so if you merely need to power a midlevel card or two, or high-end cards whose requirements aren't too steep, this is the bargain pick.

Ultra Products Power Partner

The Power Partner provides the most flexibility here. Its 325W come not just from +12V current at up to 26 amps, the highest amperage here; the unit has a +5V rail, as well. (+5V is for certain integrated circuitry and other components.)

It also sprouts three types of connections: an 8-pin PCI Express and one pair each of 6-pin PCI Express and 4-pin Molex. The Molex will let you power hard drives and optical drives, etc. The cabling isn't modular, however (and everything is combined with a 24-pin motherboard adapter for syncing with the primary PSU), so anything that goes unused will still lurk inside your case.

Cooling relies on two exhaust fans, both of which are on the back of the unit. Because they blow hot air into your case, you'll want to be sure your rig runs reasonably cool to begin with. ▲

by Brian Hodge

Pump Up Your PSU

Here's how our five supplemental PSUs check out at a glance. Connectors exclude the main PSU sync cable. Efficiency refers to how much incoming AC current is used, with the rest lost as heat. Lifespan is measured in Mean Time Between Failures. Specs unavailable from the manufacturer are listed as N/A.

	Continuous Power	Peak Power	Amperage	Connectors	Efficiency	Lifespan	MSRP	CPU Rating
E-Power Technology EP-350 Juice Box	350W	N/A	20A	(2) 6-pin PCI Express (2) 6+2-pin PCI Express	N/A	N/A	\$89	●●●●
FSP Group BoosterX 3	300W	400W	25A	(2) 6-pin PCI Express	85%	100,000 hours	\$89.99	●●●●
Spire NitroPower VGA Booster	320W	450W	20A	(2) 6-pin PCI Express (2) 8-pin Quad SLI	85%	>100,000 hours	\$79.99	●●●●●
Thermaltake Purepower Power Express	250W	300W	21A	(2) 6-pin PCI Express (1) 8-pin PCI Express (2) 4-pin Molex	75%	>100,000 hours	\$49.99	●●●●●
Ultra Products Power Partner	325W	N/A	26A	see article	73%	>100,000 hours	\$89.99	●●●●

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Brother HL-2170W

With the widespread use of wireless home networks, it's not surprising to see printer manufacturers integrate wireless print servers in printers, but at \$149.99, Brother's HL-2170W is the lowest-priced (as of press time) laser printer we've seen with 802.11b/g connectivity. Additionally, this compact monochrome laser comes with 32MB of memory to let it quickly handle documents or Web pages with graphics.

The HL-2170W is rated at 23ppm and provides a print resolution up to 2,400 x 600dpi. In our tests, both 12- and 8-point text appeared crisp, and the monochrome prints displayed graphics with smooth grayscale gradients. We timed the first page out (from ready) at 9.8 seconds with a text document and 10.5 seconds for a PowerPoint slide. Our 10-page test text document took 32 seconds to print,



Brother HL-2170W
\$149.99
Brother
www.brother-usa.com



and the 10-page PowerPoint test took 36 seconds to print.

Besides 802.11b/g connectivity, you can also connect to the printer via a USB or Ethernet cable, but note that the wired and wireless network ports can't be open at the same time. Therefore, if you choose the wireless option, computers without an 802.11b/g network adapter must connect to the printer with a USB cable or through a networked PC.

For compatibility, the printer comes with PCL6 emulation to support a range of fonts and symbols. Additionally, Brother includes a printer driver that's compatible with Windows (Window 2000

or later), Mac OS (10.2.4 or greater), and Linux (Red Hat, Mandrake, SuSE, or Debian). The front-loading, 250-sheet paper tray handles both letter- and legal-sized paper, and you can feed specialty media, such as envelopes and letterhead, into the manual bypass slot located above the main paper tray.

All told, we're impressed with the number of features Brother packed into the HL-2170W. Whether you need the freedom to locate your printer in a convenient location or just solid text and fast print speeds, the HL-2170W gives you good results for an affordable price. ▲

by Nathan Lake

Specs: Dimensions: 6.7 x 14.5 x 14.2 inches (HxWxD); 23ppm (manufacturer estimate); Resolution: 2,400 x 600dpi; Memory: 32MB; Processor speed: 181MHz

Buffalo LinkStation Pro Duo

NAS appliances offer you the storage advantages of a home file server without the need for a second PC, ideal if you want an always-on device to share and back up large collections of videos, music, or photos. The Buffalo LinkStation Pro Duo is a 1TB (two 500GB, 7,200rpm SATA drives) NAS appliance that supports a RAID 0 or 1 configuration. It features several other networking goodies, including a built-in Web server with free remote access from www.buffalonas.com, an integrated FTP server, and support for UPS connectivity.

The black-clad LinkStation Pro Duo weighs in at 6.8 pounds, and at 3.9 inches wide, it was easy to find a place for the NAS device near our router. It features a Gigabit Ethernet port, and Buffalo includes setup software that configures the NAS to your network. After running the configuration software, you open a Web-based GUI to configure the network features of the

LinkStation Pro Duo. To set up remote Web access, we only had to click the Web Access button, select Service Setup, and choose Enable; the LinkStation Pro Duo then configured the firewall on our UPnP router and registered itself on the Buffalo Web site. For remote streaming, the

Buffalo Web service has an integrated Flash player to let you stream audio files from the NAS to PCs and mobile phones.

The NAS comes with an Auto/Manual power switch; when set in Auto mode, the LinkStation Pro Duo senses Buffalo's NAS Navigator software (installed with the setup software) to let the unit turn on and off based on the power conditions of the computers in



LinkStation Pro Duo
\$449
Buffalo
www.buffalotech.com



your network. The original LinkStation Pro Duo sent to us couldn't use the Auto power function (Buffalo thought the unit may have been damaged in shipping), so Buffalo sent us a second model that responded to the power status of our PC.

Overall, we like the features found in the LinkStation Pro Duo, and its \$449 price tag is affordable for a terabyte of networked storage. ▲

by Nathan Lake

Specs: 1TB (two 500GB SATA drives) NAS; RAID 0 and 1 support; Gigabit Ethernet; Processor: 400MHz Marvell; Dimensions: 6.4 x 3.9 x 8.7 inches (HxWxD).

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

[FROM THE CORSAIR LAB]

FOR EXTREME POWER REQUIREMENTS, WE HAVE THE GEAR



Corsair Power Supplies utilize advanced technology to deliver continuous, quiet and reliable power for all critical system components. And because our power supplies offer maximum stability, they are the clear choice for system builders requiring top-of-the-line power, efficiency and performance. Also check out our **HX**, **VX**, and **TX Series Power Supplies**. Corsair. Performance. Reliability. Innovation.

[CORSAIR.COM](http://corsair.com)



AVADirect Core 2 Duo SLI Gaming System

AVADirect is serious about gaming. The Twinsburg, Ohio,-based PC builder has a range of customers, including corporate and government buyers. But its Core 2 Duo SLI Gaming System proves that AVADirect has a passion for building high-end gaming rigs.

AVADirect rustled up a brand-new (and, at the time of this writing, unreleased) Intel Core 2 Extreme QX9770 and then ramped the clock speed from 3.2GHz to a speedy 4GHz—with air cooling, mind you. A Thermalright Ultra-120 eXtreme heatsink and 120mm Zalman ZM-F3GL wick away the heat, and the PC's 11 other ZM-F3GLs (that's right, there are 12 120mm fans in this box) help the Gaming System exhaust hot air with a vengeance.

I like the Thermaltake SwordM case, which has a small, front-panel LCD (thanks to AVADirect) that displays media player info and system stats. (You can configure it via the included software.) The case's side panel door and roof open via hydraulics, adding geeky glitz to the system. I was surprised to see that the case's yellow paint job didn't completely hide the black underneath it in spots, particularly along the edges of the side panel's multiple fins. A \$300, single-color paint job should be flawless. AVADirect tells me that it hired a local body shop to apply this paint job, instead of the custom paint specialist it normally works with.

The Gaming System's QX9770 isn't the only heavy-duty component. The computer has four 150GB Western Digital Raptors, 4GB of Corsair XMS2 Dominator DDR2-1250 memory, and three Evga GeForce 8800 Ultra Superclocked video cards in a 3-Way SLI configuration.

Thanks to its top-shelf gear, the Gaming System tore up our benchmarks, posting the highest frame rates

and fastest scores I've seen. That over-clocked processor helped the PC power through the multithreaded Cinebench 10 benchmark in only 58 seconds, but the computer's real claim to fame is its gaming capabilities. The system offered 50fps in World in Conflict and 65fps in Company of Heroes. It also produced 8fps in Crysis, topping previous rigs. Importantly, games looked great when I played them. S.T.A.L.K.E.R. ran flawlessly and looked the best that I've seen it.

Clearly, the Core 2 Duo SLI Gaming System is a monster of a gaming PC. It has top-shelf components, a stunning case, and customizations the average PC user wouldn't attempt on his own. The computer's presentation and paintjob fall a little short of its luxury price tag, but the system's performance and AVADirect's tech support (which offered prompt and knowledgeable service when the system arrived with minor shipping damage) shouldn't be overlooked. AVADirect does right by its customers by providing a three-year parts and labor warranty. It also offers lifetime phone tech support. ▲

by Joshua Gulick

Benchmark Numbers

3DMark06 Pro 1.1

Overall	21325
SM2.0	8508
HDR/SM3.0	10220
CPU	5669

Cinebench 10*

Single-threaded (score)	4402
Single-threaded (min:sec)	3:20
Multithreaded (score)	15236
Multithreaded (min:sec)	0:58

Dr. DivX 2.0.1*	3:06
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POV-Ray 3.7 Beta**	3553
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PCMark Vantage Pro 1.0

Overall	6490
Memories	4730
TV & Movies	4521
Gaming	5611
Music	6915
Communications	5863
Productivity	6525
HDD	4212

WinRAR 3.71*	1:56
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Crysis 1.1	8
------------	---

Company of Heroes (4XAA) 2.1.0.2	65
----------------------------------	----

World in Conflict (4XAA, 16XAF) 1.005	50
---------------------------------------	----

S.T.A.L.K.E.R. 1.0005	93
-----------------------	----

* minutes:seconds

** pixels per second

*** Games tested at 2,560 x 1,600



Core 2 Duo SLI Gaming System
\$8,400 (as tested)
AVADirect
www.avadirect.com

Specs: CPU: Intel Core 2 Extreme QX9770; Motherboard: Evga 132-CK-NF78 (nForce 780i SLI chipset); RAM: 4GB Corsair XMS2 Dominator DDR2-1250; HDD: 150GB Western Digital Raptor (x4); Evga GeForce 8800 Ultra Superclocked 768 (3-way SLI); LAN: Integrated Gigabit; OS: Vista Home Premium 32-bit

Gigabyte GA-X48-DQ6

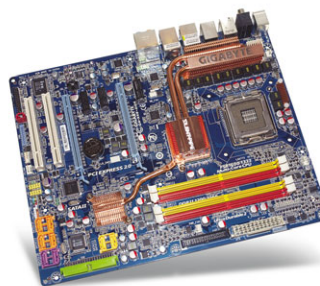
Gigabyte has been on a roll with its recent high-end motherboard offerings. In recent reviews, we were impressed by its nForce 680i SLI-, P35-, and X38-based motherboards.

Gigabyte's latest high-end motherboard to hit the CPU test bench, the X48-based GA-X48-DQ6, takes things a step further than previous offerings by incorporating the company's new DES (Dynamic Energy Saver) technology. DES is a combination of hardware and software that lets the GA-X48-DQ6 (and a few other recent Gigabyte motherboards) dynamically throttle the processor voltage and clock speed and the number of active phases in the motherboard's power array (most motherboards can't disable individual phases in their power circuitry and run fully engaged at all times) to reduce power consumption and

heat. When the processor load is low, the GA-X48-DQ6 reduces the voltages, clock speeds, and number of active power phases (and vice versa for a heavy workload). The Windows-based DES application is included with the motherboard, and its interface shows a visual representation of the above-mentioned data and tracks the amount of power saved over time.

The GA-X48-DQ6's other features include support for DDR2 memory up to 1,200MHz, JMicron and Intel RAID controllers, and CrossFire support, among many others. The board's layout is quite good, considering its extensive features.

As we've come to expect from Gigabyte, the GA-X48-DQ6's BIOS was brimming with options for tweaking performance,



and overclocking was a strong point. With a Core 2 Extreme QX9650, we were able to hit an impressive 535MHz FSB without altering the chipset voltage. Stock performance with a 333MHz FSB was strong, too. At stock speeds, the

board tore through our LAME MT and Sony Vegas benchmarks in 30 and 184 seconds, respectively. And it scored 11,805 in the Cinebench multithreaded test.

With its extensive features, solid performance, and strong overclocking, the GA-X48-DQ6 is worthy of consideration. Add these pluses to the board's support for much more affordable DDR2 memory, and Gigabyte's got another winner. ▲

by Marco Chiappetta

GA-X48-DQ6

\$299

Gigabyte

www.gigabyte-usa.com



Specs: Socket 775; Chipset: Intel X48 Express; Max Memory: 8GB; Audio: Realtek ALC889A, 8-channel; Slots: 2 PCI-E x16, 3 PCI-E x1, 2 PCI; Ports: 8 USB 2.0, 2 FireWire, 2 Gigabit Ethernet

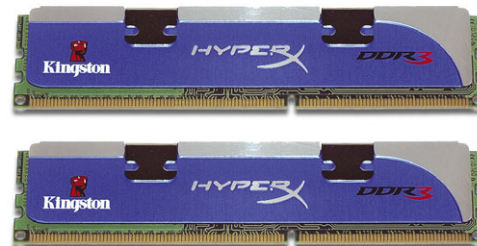
Kingston KHX14400D3K2/2G

In the January 2008 issue of CPU, we printed a DDR3 memory roundup with kits from Corsair, OCZ, Super Talent, and Kingston. (See page 70.) At the time, we asked the participants for their fastest kits available and ended up with products ranging from 1,375MHz up to a blistering 1,800MHz. Since then, DDR3 memory has continued to ramp up in speed, and the companies that offered the lower-frequency kits in that roundup have expanded their lineups to include 1,800MHz modules.

Kingston's KHX14400D3K2/2G kit couldn't be more different than the 1,375MHz kits we looked at in our January roundup. The most obvious difference is the KHX14400D3K2/2G kit's rated frequency of 1,800MHz, with default timings of 8-8-8-24 at 1.9V. But the KHX14400D3K2/2G is different from Kingston's earlier kits. It's equipped

with the company's latest heat spreader design (Kingston also ditched the Elpida chips from its earlier kits in favor of Micron's) and has plenty of overclocking headroom. Whereas the 1,375MHz KHX11000D3LLK2 and ULK2 kits weren't capable of hitting the 1.5GHz mark, the KHX14400D3K2/2G soared to 1,940MHz with a slight bump in voltage to 2V.

With an Asus P5E3 Deluxe motherboard and a 2.66GHz Core 2 Duo E6750 processor, the KHX14400D3K2/2G kit offered just over 8GBps of bandwidth, according to SiSoft SANDRA XII, when running at its rated frequency. Once we overclocked the kit to 1.94GHz, however, the kit's peak bandwidth shot up to 9.2GBps. We also experimented with different CAS latencies and found that the Kingston kit was capable of hitting slightly tighter 7-7-7-24 timings, like Corsair's



flagship kit, when we cranked its voltage to 2V.

With a street price of just under \$500 and performance that's on par with competing offerings, the Kingston KHX14400D3K2/2G looks quite attractive. It's still expensive relative to high-speed DDR2 memory, but compared to other 1,800MHz DDR3 kits, the KHX14400D3K2/2G is a bargain. ▲

by Marco Chiappetta

KHX14400D3K2/2G

\$525

Kingston

www.kingston.com



Specs: Capacity: 2,048MB (2x 1,024MB); Latencies: 8-8-8-24; Voltage: 1.9V; lifetime warranty

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

NVS PC Carbon

Hailing from Florida, NVS PC is a new system builder that wants to put a colorful twist on your next notebook—or your existing one. NVS PC's claim to fame is its ability to paint just about anything onto notebooks. It can paint any notebook panel (keypad aside) and has an array of options that range from subtle to jaw-dropping. I ordered the Carbon, the builder's top-shelf model, to see whether NVS PC's notebooks deserve their paint jobs.

NVS PC targets the Carbon at business travelers and college students, and I think the builder successfully addresses the needs of both types of customers, particularly business users. At only 1 x 12 x 8.75 inches (HxWxD) and 4.5 pounds, the Carbon is a light, travel-friendly notebook. The notebook's touchpad is responsive (critical for situations in which you don't have room to use your trusty travel mouse), and a fingerprint scanner sits between the two mouse buttons. Toss in integrated 802.11 draft-n and Bluetooth capabilities, and you're looking at a business notebook with some personality.

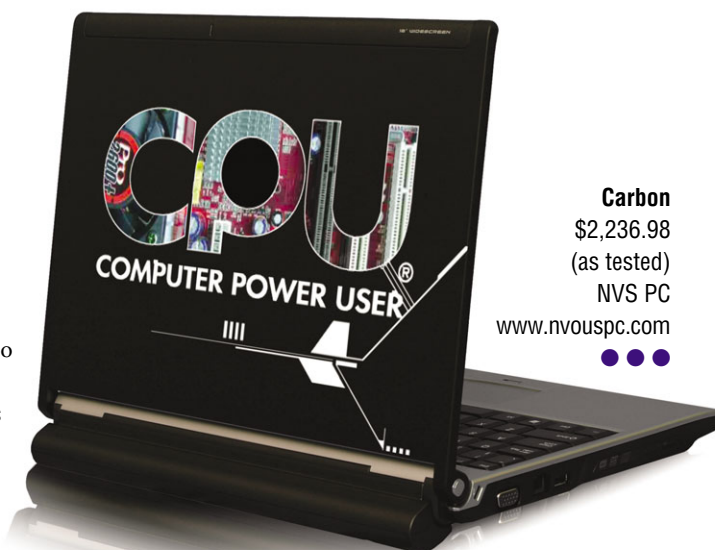
The 12.1-inch display is bright and sharp, and the keyboard has full-sized keys. The keyboard doesn't have a discrete number pad, but it does have a row of number keys that sit above the QWERTY layout. (It also has a full set of F1-F12 keys.) I was a little surprised to see that NVS didn't follow its own Web site's recommendations when it built my review unit. Whereas the Carbon's online configuration page recommends a 2.4GHz processor, 4GB of memory, and a 160GB hard drive, my review unit has a 2.2GHz Intel Core 2 Duo T7500, 2GB of DDR2-667 memory, and a 120GB Toshiba MK1237GSX hard drive. The notebook

also has a 1GB Turbo Memory card.

The same features that make the Carbon an enticing choice for business travelers help it meet the needs of on-the-go college students. That said, none of NVS PC's notebooks will floor students who want high frame rates on today's games at high settings. The Carbon isn't a graphics chump, but it's still limited to integrated graphics (Intel's GMA X3100).

Not surprisingly, the Carbon didn't knock over my gaming benchmarks, posting only 7fps at max settings (with the exception of AA/AF) in F.E.A.R. and 13fps at medium settings in S.T.A.L.K.E.R., but it plays the games if you're willing to cut way back on special effects. The processor contributed to the notebook's overall PCMark05 score (the processor alone scored 5611).

So, NVS PC puts out a decent notebook, but it's not breaking any innovation records in the hardware department. The builder really shines in the painting arena, both because it



Carbon
\$2,236.98
(as tested)
NVS PC
www.nvouspc.com



offers gorgeous paint jobs and because the process for ordering the paint job is so smooth. NVS can paint images and designs that the customer supplies but has plenty of its own designs that customers can choose from, including works by hip artists. Oscar Zapata, the

president and co-founder of NVS PC, tells me that NVS uses a proprietary paint that resists cracking, even when the plastic panels bend.

The NVS PC online Virtual Paintshop is fun to use. You can choose from several colors and dozens of predefined images or upload your own. The colors and predefined images appear on notebook illustrations in the configurator as soon as you select them. Once you place the order, NVS PC's designers contact you and discuss the project to make sure you get the notebook you wanted. With that sort of attention to detail, NVS PC looks like a safe bet for users who want to give their notebooks a personal touch. ▲

Benchmark Numbers

Cinebench 10

Single-threaded (timed*)	6:22
Single-threaded (score)	2314
Multithreaded (timed*)	3:31
Multithreaded (score)	4189

Dr. DivX 2.0.1*	6:24
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F.E.A.R. (no AA/AF)	7
F.E.A.R. (CPU-intensive)	38

PCMark05

Overall	4181
CPU	5611
Memory	3316
Graphics	1961
HDD	4205

POV-Ray 3.7 Beta**	968.37
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S.T.A.L.K.E.R. **	13
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WinRAR 3.71*	3:52
--------------	------

* minutes:seconds

** pixels per second

*** Games tested at 1,280 x 800

Specs: 2.2GHz Intel Core 2 Duo T7500; Mobile Intel GM965 Express; 2GB DDR2-667; 120GB Toshiba MK1237GSX; Integrated Intel GMA X3100; LG GSA-H20N DVD±RW; LAN: Integrated Gigabit, Intel Wireless Wi-Fi Link 4965AGN; 1GB Intel Turbo Memory; Vista Premium 32-bit; one-year warranty

by Joshua Gulick

SanDisk Sansa TakeTV PC To TV Video Player

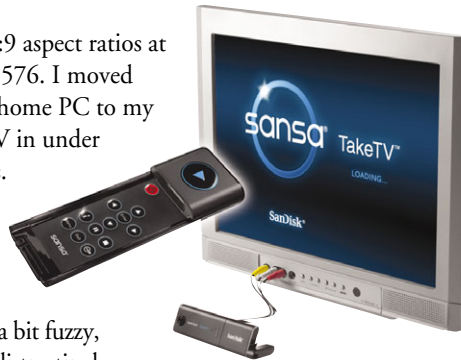
The TakeTV isn't without a few omissions that would have seemed no-brainers to include. Still, if you're lacking the means to stream video from your Linux, Windows XP/Vista, or Mac computer to a TV, the TakeTV is about as easy a method as imaginable—if the video is in MPEG-4, Xvid, or DivX format.

Essentially, the TakeTV (about 4.5 x 1.5 inches [H x W]) is a USB 2.0-compliant thumb drive that plugs into your computer. Drag and drop unprotected video to the TakeTV, unplug it, and then stick it in the cradle SanDisk provides that connects to a TV via included video (S-Video or composite) and analog audio cables. A remote houses the TakeTV when not in use. Playback software offers a menu to scroll through your files. Select a file, press Play, and you're viewing video

in 4:3 or 16:9 aspect ratios at up to 720 x 576. I moved files from a home PC to my bedroom TV in under five minutes.

Video quality was surprisingly good, albeit a bit fuzzy, though not distractingly so. Audio was less satisfying but serviceable considering the TakeTV's intended purpose. I wasn't able to display JPEGs or other photo formats from the drive—odd considering SanDisk's acumen for storage devices. I could transfer data files, though.

If you're hurting for content, SanDisk offers TV and movie downloads via its fanfare beta service (fanfare.com) at \$1.99



a pop, though all offerings were “free for a limited time” at press time. You do need SanDisk's fanfare software (3.9MB), and only Vista and WinXP are supported. Further, content downloads directly to the TakeTV and isn't viewable on the computer.

Variety was limited at press time to select shows and movies from CBS, Showtime, TV Guide, Jaman, and the Smithsonian Channel. NBC programming is listed as coming soon. ▲

by Blaine Flamig

TakeTV PC To TV Video Player

\$149.99 (8GB); \$99.99 (4GB)

SanDisk

www.sandisk.com



Specs: Stores about 5/10 hours video (4GB/8GB); Max display resolution: 720 x 576; Supported formats: MPEG-4, Xvid, DivX; 4:3 or 16:9 aspect ratios

Vuzix iWear AV920

As much as I want some things to live up to the hype, they rarely do. Such is the case with the iWear AV920, a visor reminiscent of Geordi's in “Star Trek: The Next Generation.” Vuzix says the AV920 is equivalent to watching a 62-inch screen from 9 feet away, providing “all the privacy of your own virtual movie theater.” By focusing your eyes on nothing but the AV920's display, it does have a big-screen feel. Unfortunately, it's not a feeling worth nearly \$350.

Vuzix's efforts are commendable, though. The AV920 offers 2D and 3D functionality; it works with devices with a composite video jack, including game consoles; its integrated Li-Ion battery provides about five hours of power; and video outputs to an acceptable 640 x 480 per screen. Vuzix also gives you what you need to get going (A/V cables, mini-USB charger, AC adapter, etc.). The design isn't bad, either. The visor weighs just 2.9 ounces

and integrates flexible, removable earbuds.

The AccuTilt viewer pivots 15 degrees, and an optional immersive eyeshield (\$14.95) blocks out nearly all ambient light.

Negatively, the embedded twin LCDs the AV920 uses to reproduce images never left me feeling I was viewing just one 62-inch screen. Additionally, maintaining a good viewing angle was a chore. Vuzix says the AV920 features its “best mobile experience yet,” but I can't imagine using the visor for anything but stationary applications. Additionally, video during “300,” “The Departed,” and “The Last Waltz” was noticeably soft and colors borderline accurate. The AV920's handling of “Spy Kids 3-D: Game Over” was surprisingly immersive, however, as various objects displayed realistic depth



and convincing movement.

The integrated headphones output generally

strong and clear audio, but I did

notice a distracting, steady buzz while using

standalone headphones that seemed to stem from the power adapter.

Interestingly, Vuzix's newer AV920-C lets gamers daisy-chain multiple AV920s. Thus, if you're playing Halo 3, for example, each player views his own 62-inch virtual screen rather than view one screen divided into sections. ▲

by Blaine Flamig

iWear AV920

\$349.95

Vuzix

www.vuzix.com



Specs: Twin 640 x 480 LCDs; 2.9 ounces; integrated headphones

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Maingear Ephex

3-Way SLI Gaming System

Nvidia's 3-Way SLI, along with the motherboards and graphics cards that enable it, just screams "killer gaming rig" to boutique builders and major OEMs. And, of course, boutique PC builders such as Maingear are quick to jump on the bandwagon when products like this, which are targeted to the performance enthusiast, hit the market. Without question, three high-end graphics cards chained together in a system like the Maingear Ephex is the type of setup that caters to a select niche within a niche.

Maingear's Ephex line of desktops is its high-end flagship product. The Maingear Ephex we tested was built within a black Silverstone TJ10 case—to say it's an absolute tank would be an understatement. A 1,200-watt Silverstone DA1200 PSU rests at the bottom of the chassis to power this beast of a rig. The DA1200 handled

the draw of the system's three Evga GeForce 8880 Ultra cards with ease but also put out a tad more noise than we would have liked.

At the heart of our test specimen was an Evga nForce 680i-based 122-CK-NF68 with an Intel Core 2 Extreme QX6850 overclocked to 3.8GHz and warranted (for three years) by the factory at this speed. (Maingear updated its offering to an overclocked, liquid-cooled QX9650 and 780i motherboard as we went to press.) The "special sauce" Maingear used to get Intel's quad-core CPUs to this impressive speed is none other than Asetek's LCLC (Low Cost Liquid Cooling) system. This self-contained liquid cooler is a gem of a setup that bolts to one of the TJ10's 120mm fan ports, letting its radiator exhaust out the top of the system. Overall, the LCLC worked well and kept the hotter-running

65nm Kentsfield running no hotter than 52 degrees Celsius, even under 100% load. And we never experienced so much as a twitch in stability during extensive testing. Now imagine the same system configuration but with Maingear's QX9650 upgrade and clocked at 4GHz—too sweet.

We also applaud Maingear's cable management system and choice of subsystem components. Maingear chose 2GB of Corsair's fabulous Dominator series XMS2-8500 DDR2-1066 system memory for the build, as well as a pair of Western Digital's killer-fast, 150GB Raptors in RAID 0. A 750GB Seagate Barracuda joins

the ride to provide mass storage. Inside the Ephex's case, the layout and cable organization is immaculate, with zip-ties and routing.

You might have a tough time justifying the expense of a system with 3-Way SLI like the Maingear Ephex, but you'd also have a hard time finding another preconfigured system that puts up the same outstanding numbers. ▲

by Dave Altavilla

Benchmark Numbers

3DMark06 Pro 1.1

Overall	19349
HDR/SM3.0	7683
CPU	5206

Cinebench 10*

Single-threaded (score)	3883
Single-threaded (min:sec)	3:47
Multithreaded (score)	13117

Lame MT	0:23*
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POV Ray	3201**
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PCMark Vantage Pro 1.0

Overall	6377
Memories	5040
TV And Movies	4376
Gaming	5794
Music	6444
Communications	5598
Productivity	6431
HDD	4921

Crysis 1.1 (2XAA, High Quality)***	44.33
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Company of Heroes (4XAA) 2.1.0.2	62.5
----------------------------------	------

ET Quake Wars (4XAA)	89.4
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* minutes:seconds

** pixels per second

*** Crysis tested at 1,920 x 1,200.

Other games tested at 2,560 x 1,600.



Specs: CPU: Intel Core 2 Extreme QX6850 @ 3.8GHz, Evga 122-CK-NF68, 2GB Corsair Dominator DHX DDR2-1066, HDD: 150GB WD Raptor (2x RAID 0), Seagate ST3750640AS 750GB, Graphics: Evga GeForce 8800 Ultra (3-Way SLI), Windows Vista Ultimate 32-bit; three-year warranty

Ephex

\$6,676 (as tested*)

Maingear

www.maingear.com



*Price includes Intel QX9650 and Nvidia 780i motherboard. Intel QX6850 and 680i-based motherboard no longer available as an option.

Intel Core 2 Extreme QX9775 & D5400XS

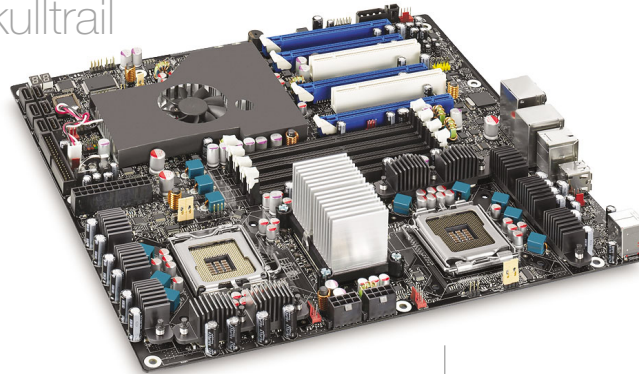
Feast Your Eyes On Skulltrail

This year is shaping up to be the year of eights. Just last month, *CPU* reviewed AMD's flagship Phenom 9900 running on its quad-CPU and quad-GPU Spider platform. (See page 32.) Intel's Skulltrail represents the firm's latest exercise in eights and makes AMD's Spider platform look like an octogenarian in comparison. But while AMD's platform is meant for those of mainstream means, Intel's Skulltrail was designed for the elite PC enthusiast (relatively speaking). Although Intel hadn't finalized prices as we went to press, the CPU, mobo, and memory combo will likely cost upward of three grand.

This double quad-core CPU and motherboard platform replaces last year's V8 and avails itself of two Intel Core 2 Extreme QX9775 processors clamped into Intel's D5400XS motherboard. Each QX9775 features a 3.2GHz clock speed, a 1,600MHz FSB, 12MB L2 cache, and a TDP of 150W. The D5400XS motherboard is built around Intel's 5400 chipset and features a pair of LGA 771 sockets, which are traditionally reserved for Xeon processors. The QX9775 that Intel put into the Skulltrail actually bears a striking resemblance to the LGA 775-based Core 2 Extreme QX9770, which has the same clock speed, FSB, and L2 cache.

For this revision of its 8-core platform, Intel decided to strike many of the original V8's workstation-centric features, such as the integrated SAS controller and the pair of PCI-X slots, in favor of more enthusiast-friendly goodies, such as 8-channel audio, eSATA ports, an S/PDIF port, FireWire, and up to 10 USB ports.

The D5400XS features four DDR2 FB-DIMM (Fully Buffered DIMM) slots, which sacrifice some latency for bandwidth, but each slot gets its own memory channel. Intel really tempts gamers and graphics professionals by including four x16 PEG slots. Better yet, Skulltrail is capable of both SLI (thanks to a pair of Nvidia nForce 100



MCPs) and CrossFire (thanks to a lack of proprietary core logic found in ATI's architecture). Intel also set out to please overclockers by including BIOS-based frequency and voltage switches for the CPU and memory.

My Skulltrail kit included two Zalman CNPS9500 AT 2 Ball CPU coolers and a pair of 2GB 800MHz FB-DIMMs. The rest of my test system consisted of a 150GB Raptor hard drive, an ATI Radeon HD 3870 (Catalyst driver version 8.1), and an 850-watt PSU from Cooler Master. I ran our benchmark suite under the 64-bit version of Windows Vista Ultimate.

Despite architectural improvements, Skulltrail didn't fare any better than V8 in a number of benchmarks, including 3DMark06's CPU tests, Dr. DivX, and Cinebench. SiSoft Sandra, however, revealed impressive gains in all categories. Skulltrail's Dhrystone ALU and Whetstone iSSE3 scores were 6% and 14% better than V8's scores. Floating Point x8 iSSE2 saw a significant 49% gain. Skulltrail also took a commanding lead in Sandra's memory bandwidth tests, scoring 28% better than the V8 in the Integer Buffered iSSE2 test and 36% better in the Floating-Point Buffered iSSE2 test.

Intel pumped Skulltrail full of everything a PC enthusiast dreams about. For most of us, the price tag is a rude awakening, but for those with fat wallets, this is one gaming and content-creation platform that won't hold you back. ▲

by Andrew Leibman

D5400XS

Retail price unavailable
at press time

Dual Intel Core 2 Extreme QX9775

\$1,499

Intel

www.intel.com



Intel Skulltrail

3DMark06 Pro 1.1

Overall	9469
SM2.0	3533
HDR/SM3.0	3556
CPU	6197

PCMark Vantage Pro 1.0

Overall	6031
Memories	4613
TV And Movies	4477
Gaming	5497
Music	5948
Communications	4996
Productivity	5960
HDD	4535

Dr. DivX 2.0.1*

WinRAR 3.71*	4:13
--------------	------

WinRAR 3.71*

Cinebench 10*	2:05
---------------	------

Cinebench 10*

Single-threaded (min:sec)	3:46
Single-threaded (score)	3902
Multithreaded (min:sec)	0:37
Multithreaded (score)	23681

POV-Ray 3.7 Beta**

SiSoft Sandra Lite XII SP1	5294.23
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SiSoft Sandra Lite XII SP1

Processor Arithmetic

Dhrystone ALU (MIPS)	117,322
----------------------	---------

Whetstone iSSE3 (MFLOPS)

Whetstone iSSE3 (MFLOPS)	85,166
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Processor Multi-Media

Integer x8 iSSE3 (itps)	696,117
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Floating Point x8 iSSE2 (itps)

Floating Point x8 iSSE2 (itps)	530,853
--------------------------------	---------

Memory Bandwidth

Integer Buffered iSSE2 (MBps)	5,238
-------------------------------	-------

Floating-Point Buffered iSSE2 (MBps)

Floating-Point Buffered iSSE2 (MBps)	5,556
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Crysis 1.1 (4XAA)*

World in Conflict (4XAA, 16XAF)**	4:06
-----------------------------------	------

World in Conflict (4XAA, 16XAF)**

	5
--	---

* minutes:seconds

** pixels per second

*** Games tested at 2,560 x 1,600

Specs (D5400XS):

Chipset: Intel 5400;
1,600MHz FSB; Sockets: 2x LGA771; Max
memory: 16GB ECC FB-DIMMs; Ports: 6 SATA,
2 eSATA, 1 Gigabit Ethernet, up to 10 USB, up
to 2 FireWire; Slots: 4 PCI-E x16, 2 PCI

Specs (Core 2 Extreme QX9775):

Socket
LGA771; 3.2GHz clock speed; 1,600MHz
FSB; 12MB L2 cache; TDP: 150W

Toshiba Qosmio G45-AV680

You won't want to lug the 10-pound Toshiba Qosmio G45-AV680 to Starbucks, but you'll want to kick back in your living room and enjoy movies and TV with its high-definition features and music with its excellent audio quality. The glossy black pearl exterior makes it easy on the eyes, especially if you like a laptop with a little meat on its bones.

The Qosmio has solid hardware packed into its hefty frame, including an Intel Core 2 Duo T7300 CPU, 320GB with dual 160GB HDDs, and an Intel Wireless WiFi Link 4965AGN (802.11a/g/n). An integrated 2MP Web cam, Bluetooth capabilities, and a fingerprint reader are also included.

The Qosmio was designed to entertain, with its HD DVD SuperMulti drive, external USB HDTV tuner, and four built-in harmon/kardon stereo speakers (with built-in subwoofer and 1-bit digital amplifier). I watched the HD DVD "Batman Begins" on the Qosmio, and the aforementioned features, combined with the 17-inch widescreen, 1080p LCD display (native resolution of 1,920 x 1,200), were able to really present the movie well.

It should be noted that while those HD DVDs look great on the Qosmio, it will likely become a dead format in the near future. The Qosmio also has S-Video and HDMI outputs.

The Qosmio incorporated the Nvidia GeForce 8600M GT graphics card, with 512MB of dedicated memory, which isn't bad for a laptop, but the Qosmio didn't do particularly well on gaming benchmarks. This won't be pleasing to the high-intensity gamer, but the Qosmio can still be appealing to a more casual gamer, especially with the other features it has to offer. ▲

by Tessa Warner Breneman

Qosmio G45-AV680

\$2,999.99

Toshiba

www.toshibadirect.com



Specs: 2GHz Intel Core 2 Duo T7300; 2,048MB PC2-5300 SDRAM; 320GB (2x 160GB SATA HDDs); Nvidia GeForce 8600M GT; Bluetooth; 802.11a/g/n; Windows Vista Ultimate 32-bit

Benchmark Numbers

3DMark06 Pro 1.1

Overall	2942
SM2.0	1185
HDR/SM3.0	7039
CPU	1753

Cinebench 10

Single-threaded (min:sec)	7:15
Single-threaded (score)	2033
Multithreaded (min:sec)	3:51
Multithreaded (score)	3825

Dr. DivX 2.0.1*

7:38

PCMark Vantage Pro 1.0

Overall	2713
Memories	1935
TV And Movies	1755
Gaming	2663
Music	3088
Communications	2724
Productivity	2385
HDD	2544

POV-Ray 3.7 Beta**

909.36

WinRAR 3.71 *

4:07

Company of Heroes

3.5

S.T.A.L.K.E.R.

8.461

* minutes:seconds

** pixels per second

*** Games tested at notebook's native resolution: 1,920 x 1,200

Rosewill RX81-MP-SC

The RX81-MP-SC is a hot-swappable external hard drive enclosure made of heat-dissipating aluminum. Designed to reside in an office rather than a laptop case, the RX81-MP-SC is somewhat bulky (13.5 x 22.5 x 3.5cm [HxWxD]) and requires a separate power adapter. This probably isn't an enclosure you'll be toting around.

The device supports hard drives up to 1TB, although you'll have to purchase a hard drive separately. Installing a drive (an 80GB Seagate Barracuda 7200.7, in my case) in the RX81-MP-SC was somewhat

time-consuming. I had to remove two screws to get the outside case apart, four to get in to the enclosure, and then I had to use another four to secure the hard drive to the case when I installed it. However, the hard drive itself popped right in without any fuss. Once I put the whole thing back together, the unit worked immediately. There was no software to



RX81-MP-SC

\$149.99

Rosewill

www.rosewill.com



install; the plug-and-play feature worked smoothly.

The Seagate drive I used was NTFS, but the enclosure also supports Mac OS 8.6 and above, as well as Linux 2.4.1.0 and above, so you can format a drive to use the RX81-MP-SC with just about any system. The variety of ports adds to the RX81-MP-SC's format-friendliness. You can connect the enclosure to a computer or network hub via five different interfaces

(from USB 1.1 to eSATA), so the device will work with computers young and old. ▲

Specs: Hard Drive support: 3.5-inch SATA up to 1TB; Ports: eSATA, 2 FireWire 800, FireWire 400, USB 2.0, USB 1.1; OS Support: Windows 98SE/Me/2000/XP/Vista, Mac OS 8.6 and above, and Linux 2.4.1.0 or above; Dimensions: 13.5 x 22.5 x 3.5cm (HxWxD)

by Seth Colaneri

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

THUNDER

3 in 1 power supply

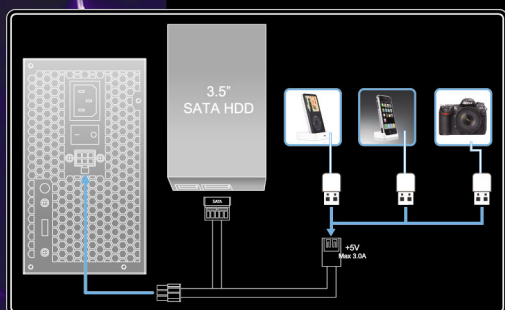
Power supply for PC
Power Charger for USB device
SATA Power for external SATA Hard Drives



SATA Power for external SATA Hard Drive.



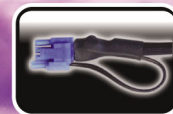
Power Charger for USB device...even when system is OFF.



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(TD1 only)



6+2 Pin PCI express lead for highend graphics card power demand



Designed for RoHS standard to make a greener and cleaner world.

Canon PowerShot S5 IS

Canon's PowerShot S5 IS is a worthy alternative to a D-SLR. This 8MP camera features a powerful 12X optical zoom lens and a 2.5-inch swiveling LCD, and the camera's comfortable grip makes it more comfortable to use than similar cameras, such as Canon's PowerShot G9.

Canon improves this camera's 12X optical zoom by incorporating its IS (Image Stabilizer) technology, which detects small movements of the camera and then moves the lens' interior optical components in the opposite direction of the movement. This cancels out much of the effect of the camera shake, resulting in crisper images, even when you can't hold the camera perfectly still.

This camera's aperture can open as wide as f/2.7 (wide angle) and f/3.5 (telephoto). Canon offers further help in low-light conditions with light sensitivity settings as high as ISO 1600; however, images suffer from noise above ISO 200.

The S5 IS can take impressive close-ups with a Macro mode that focuses as close as 3.9 inches and a Super Macro mode, which, according to Canon, has a minimum range of 0 inches. In my testing, I only needed



PowerShot S5 IS

\$399.99

Canon

www.usa.canon.com



enough distance to allow a sliver of light to expose the image. When I also used manual focus, I took close-ups that revealed the texture of flower petals and the grain of paper.

The S5 IS fills an important niche, offering more power than most compact cameras. The only thing it really lacks is support for RAW mode. However, the user who wants a wide zoom range and advanced manual settings should appreciate the S5 IS' flexibility. ▲

by Kylee Dickey

Specs: Megapixels: 8.3 total, 8.0 effective; Image sensor: 1/2.5-inch CCD; Optical zoom: 12X; Focal length: 6mm to 72mm, f/2.7 to f/3.5 (equivalent to 36mm to 432mm on a 35mm film camera); Focusing range: 1.6 feet to infinity (wide), 3 feet to infinity (telephoto), 3.9 inches to 1.6 feet (macro); 0 inches to 3.8 inches (Super Macro); LCD: 2.5-inch, 207,000-pixel Vari-Angle LCD; Shutter speed: 15 seconds to 1/3,200 seconds; Light sensitivity: ISO 80/100/200/400/800/1600; Flash: built-in flash/hot shoe for external flash

Apricorn Aegis Vault (120GB)

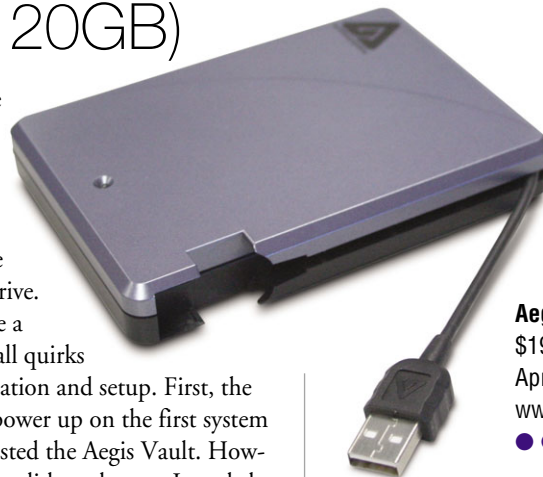
Apricorn's Aegis Vault provides a way to transport your files without risking that they fall into the wrong hands. This portable drive features 128-bit AES encryption and password protection.

The Aegis Vault comes with software for managing the drive and granting user permissions. The first program is VaultTray, which lets you create one administrator account and up to three user accounts, each with a unique password. VaultTray also lets you access your encrypted drive by typing your password. The second program is VaultResize, a utility that lets you reallocate the drive's encrypted partition. With this utility, it's possible to create both publicly accessible and private, encrypted partitions. Finally, Apricorn includes the third program, VaultConsole, which lets you access your encrypted files when you are using a computer that doesn't have VaultTray installed. You can either carry

VaultConsole on a separate disc or install it on the public portion of the Aegis Vault drive.

There were a couple of small quirks during installation and setup. First, the drive didn't power up on the first system on which I tested the Aegis Vault. However, the drive did work once I used the bundled USB Y-cable, which Apricorn says is rarely necessary to use the drive. The second problem was that I could only launch VaultResize if I first closed VaultTray; otherwise, I received an error message and the program wouldn't start.

It was simple to set up the administrator and user accounts through VaultTray, and VaultResize was equally intuitive for



Aegis Vault (120GB)

\$199

Apricorn

www.apricorn.com



creating an encrypted partition. Once you create the encrypted partition, you can use Windows Disk Management to format the public partition.

The Aegis Vault is available in 80/120/160/250GB capacities and is compatible with Windows 2000/XP/Vista. The Vault's size and security features make it an excellent option for transporting files between systems. ▲

by Kylee Dickey

Specs: RPM: 5,400; Buffer: 8MB; Shock mounting: 16-point omnidirectional; Operating shock: 300G 2ms; Nonoperating shock: 1,000G 1ms; Encryption: 128-bit AES; Weight: 5.5 ounces; Dimensions: 0.75 x 3.3 x 4.7 inches (HxWxD); Interface: USB 2.0

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

AT&T Tilt

The Tilt may not have the same coolness factor that the Apple iPhone has, but it does offer some added features that make it a worthy phone, especially for users looking to upgrade from the AT&T 8525. As its name suggests, the Tilt's screen tilts up to 40 degrees to a notebook-like viewing angle. This feature is handy, especially if you want to watch a video or read email while the phone is resting on a desk. The touchscreen itself had good color and brightness and responded quickly to taps with my fingernail and the phone's stylus.

I also liked that this phone has integrated GPS, HSDPA, Bluetooth 2.0 (with A2DP profile), and 801.11 b/g. The Tilt comes with a link to download a 30-day trial of TeleNav. After the trial, the service costs \$9.99 per month. If an additional monthly fee doesn't appeal to you, try Windows Live Search or Google Maps with the Tilt's GPS receiver.

According to AT&T, the Tilt's battery life is up to four hours of talk time and up to eight days of standby time; your mileage may vary. The device comes with 256MB flash ROM and 128MB SRAM.



Tilt

\$549.99 (before contract discounts)

AT&T

www.wireless.att.com



Of course, Windows Mobile 6 and the Tilt's other programs consume some of the flash memory.

The pictures I took with the phone's 3MP camera were OK, but a steady hand is required to get a respectable shot.

It is hard to beat the Tilt in terms of features. A few drawbacks aside (soft key accessibility and so-so camera), this phone is worth considering if you're looking for a smartphone that can handle both work and play. ▲

by Jennifer Johnson

Specs: 6 ounces; 4.4 x 2.3 x 0.73 inches (HxWxD); 802.11b/g; GPS; Bluetooth 2.0; 2.8-inch 240 x 320 64K tilting color touchscreen; Qualcomm 400MHz processor; quad-band GSM/GPRS/EDGE, tri-band UMTS/HSDPA; 256MB flash ROM; 128MB SRAM; microSD expansion slot

PC MicroWorks Black-Hawk XR5

Attempting to blur the boundaries between a desktop and a notebook, PC MicroWorks Black-Hawk XR5 incorporates a number of features not always available in portable machines. This beast can house a quad-core Intel Core 2 Quad Q6700 and up to two Nvidia GeForce Go 8800 GTX cards in SLI, 4GB of DDR2-800, and three 3Gbps SATA drives in a RAID. Additional options for the XR5 include EVDO or HSDPA connectivity, GPS, and a biometric fingerprint scanner. Another add-on, the PC MicroWorks three-year Diamond Blanket Protection Program, gives you access to wholesale upgrades to your notebook, a trade-in credit, and more. See PC MicroWorks' warranty page for more details.

My system had a single 8800 GTX, yet it still broke 10000 in 3DMark06 (10070 to be exact); PC MicroWorks expects the dual-card model to score over 14000. As you might expect, the XR5 draws a lot of power, lasting for about 71 minutes on battery while downloading a file over the notebook's integrated 802.11a/g/n adapter.



Black-Hawk XR5

\$5,382 (as tested)

PC MicroWorks

www.pcmicroworks.com



The XR5's 17-inch WUXGA+ wide-screen display was crisp and clear. This display supports full HD resolution at 1,900 x 1,200 for Blu-ray movie playback and 3D applications. For additional flexibility and compatibility with applications, my test unit shipped with a dual-boot configuration running Windows XP and Vista Ultimate. ▲

by Jennifer Johnson

Specs: 2.66GHz Intel Core 2 Quad Q6700; 4GB DDR2-800; SATA300 (3x 200GB, 7,200rpm); BD-RE / DVD-RW DL / CD-RW; Nvidia GeForce Go 8800GTX 512MB DDR3

PC MicroWorks Black-Hawk XR5

Benchmark Numbers

3DMark06 Pro 1.1

Overall	10070
SM2.0	4154
HDR/SM3.0	3979
CPU	3822

Cinebench 10

Single-threaded (min:sec)	4:57
Single-threaded (score)	2977
Multithreaded (min:sec)	1:23
Multithreaded (score)	10652
Dr. DivX 2.0.1*	5:50

PCMark Vantage Pro 1.0

Overall	5411
Memories	3390
TV & Movies	3871
Gaming	4611
Music	4191
Communications	4979
Productivity	5429
HDD	3648
POV-Ray 3.7 Beta***	2399.82
WinRAR 3.71 *	2:31
Company of Heroes	16.5
S.T.A.L.K.E.R.	37.638
World in Conflict	14

* minutes:seconds

** pixels per second

*** Games tested at notebook's native resolution (1,920 x 1,200)

CPU RANKING ○ 0 = ABSOLUTELY WORTHLESS | ●●● 2.5 = ABSOLUTELY AVERAGE | ●●●●● 5 = ABSOLUTELY PERFECT

Anand's Corner

by Anand Lal Shimpi

The MacBook Air: Good But Not Revolutionary

Apple really raised the bar for excellence with the iPhone announcement two Macworlds ago. What Apple promised at the time seemed impossible, or at least unlikely, but we all wanted it. We wanted the revolutionary interface, the sleek styling, and we wanted what Apple claimed it had designed. Months later, when it arrived, the world was blown away that Apple was able to deliver what it had promised.

How could Apple possibly top the iPhone announcement? It's like getting someone an amazingly thoughtful gift for his birthday; sure, the instantaneous reaction is incredible, but you've just raised the bar to an often impossible level for next year. Expectations were high, and when rumors started to surface about an ultraportable MacBook Air being released at the show, imaginations ran wild.

Prior to the iPhone, Apple had never made a smartphone. The company looked at the market, saw what was wrong, and made the iPhone better. Apple isn't a company that creates new things, it's a company that looks at existing devices and tries to make them better. If the Dells and Microsofts of the world got it perfect the first time around, Apple would have no room to compete; Apple thrives on knowing that the major players in any industry aren't perfect.

When it was clear that Apple was going after the ultraportable market, the hope was that Apple would do the same thing it had done for smartphones. I wanted Apple to create an ultraportable that would change the way we view notebooks; I wanted the best, most practical, most useful ultraportable to ever hit the market.

For several years in my computing life, I was in search of the perfect ultraportable. As soon as something smaller, thinner, or lighter came out, I bought it and tried to use it, and every single time, I eventually grew too frustrated with the thing and went back to a more practical notebook. The keyboards were always too cramped, the screens too small, the performance too low; ultraportables were great to carry around, but that was little comfort when the time came to unfold and actually use them. If anyone could succeed where everyone else failed, I figured it would be Apple.

From the get-go, it's clear that the MacBook Air isn't the perfect ultraportable. Expansion is very limited; there's no optical drive (you can buy one for \$99), no integrated Ethernet (you can buy a USB dongle for \$29), and most importantly, there's no clean way of getting 3G cellular network access on the notebook.

Given that Wi-Fi doesn't exist everywhere, 3G support is a necessity. Your only option for 3G on the MacBook Air is

through a USB modem, which you'll probably need to connect to a USB extension cable, thanks to the low-profile USB connector on the Air. (That's two more things you need to carry around with you.)

The Air's footprint is also not that small, although the unit is incredibly thin. The footprint isn't much different from the regular MacBook, as it uses the same screen and keyboard, the latter being one of the most important features of the Air. The full-sized keyboard is unbelievably pleasant to type on; in fact, it's the most useful I've ever used on an ultraportable.

The performance of the Air is also quite good, due entirely to Apple's choice to use a 1.6GHz (optional 1.8GHz) Core 2 Duo CPU. The disk performance leaves something to be desired, but SSD cost and performance will improve over the coming months, making an upgrade much easier than today.

The build quality of the Air is also the best I've ever seen in an ultraportable; it's light, but it doesn't feel like it's going to break. Many scoffed at the Air's 3-pound weight because many of their competitors' products are closer to 2 pounds now, but Apple's tradeoff of weight for rigidity was the right one—Apple got the feel perfect with the Air.

The MacBook Air isn't the revolutionary device I was hoping for and expecting from Apple. At the same time, it's a pretty good ultraportable, and the only one that runs OS X. The decision to buy it or not should be much simpler than most of the online discussion has made it out to be. ▲



Anand Lal Shimpi has turned a fledgling personal page on GeoCities.com into one of the world's most visited and trusted PC hardware sites. Anand started his site in 1997 at just 14 years old and has since been featured in USA Today, CBS' "48 Hours," and Fortune. His site—www.anandtech.com—receives more than 55 million page views and is read by more than 2 million readers per month.

Talk back to Anand at anand@cpumag.com

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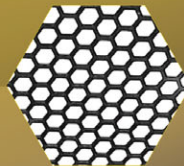
Note : In order to generate 500W of energy, Seasonic PSU only needs 595W of AC input compared with other non-80Plus certificate PSU that needs 735W of AC input. In short, choosing Seasonic PSU will save you 140W just right there!



Seasonic Blue Badge



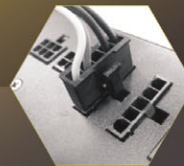
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Honey Comb Structure



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The Shark Tank

by Alex "Sharky" Ross

Nvidia's Hybrid Power

With CES out of the way, this is usually a quiet period of the year, so when any of the big-name technology companies such as Intel, AMD, or Nvidia have something to talk about, we're all ears. In fact, just prior to CES, Nvidia announced its new Hybrid SLI technology. Usually those two aforementioned words don't gel very well for someone like myself. To me, hybrid equates to Prius (or "compromise"), and SLI means no compromise and extreme gaming performance. Nvidia's announcement isn't actually the first time I've heard terms coined such as these. At the end of 2007, AMD announced its Hybrid Cross-Fire technology to show the performance benefits of combining on-board IGP (integrated graphics product) graphics with discrete graphics cards. Hence, the idea isn't completely new, but Nvidia wasn't going to sit idle, was it?

Nvidia's Hybrid SLI will allow the end user to stack up an IGP along with a discrete GPU for two new modes dubbed "GeForce Boost" and "Hybrid Power." The GeForce Boost mode shares the 3D rendering workload between GPU and IGP for improved performance. In order to actually use this mode, you'll need one of Nvidia's new 700a-series of motherboards sporting its new mGPU (otherwise known as an IGP) and a budget-minded GeForce 8500 GT or 8400 GS. The architecture in those two discrete GPUs is markedly similar to that of the 700a's IGP, hence no hardware modifications are necessary for GeForce Boost. It will be accessible via the driver. SLI will use the same alternate frame rendering that we're used to on the high end. The IGP is used as the primary display and uses block transfers to transfer the discrete GPU's rendered image to the IGP's frame buffer. As you'd expect with Nvidia's strong software forte, the driver will have built-in AI for balancing to prevent either of the two graphics parts from sitting idle. There are no plans for this at the high end because pairing any IGP with an expensive

discrete part could be more like a case of "deceleration," where the faster GPU is always waiting for the IGP to render its share of frames.

Hybrid Power mode is another benefit of this technology, in which combining a discrete GPU with an IGP actually allows you to save power. When the monitor is connected to the IGP, the more power-hungry discrete GPU can be completely shut down

when not required. As with most forms of power saving, you get less heat, less noise, and in the mobile space, improved battery life. The operation of enabling and/or shutting down is achieved via the SMBUS connection which is part and parcel of the PCI Express specification.

Having both Nvidia and AMD open the doors to mixing and matching GPUs with IGPs is only going to help game developers on the PC platform, who for the most part have publishers hamstringing them to design their game to run on "existing" hardware; in other words, the lowest common denominator. By and large, it's always been this way in the games industry. Not everyone can afford to shell out for a pair of shiny new graphics cards. Historically, motherboards with onboard graphics have been something to shy away from. If an IGP is present on your platform, no gamer in their right mind would be caught fragging with it, would they? Instead, we opt for a discrete GPU (or two) to populate that PCI-E spot. Hence what you're left with is a redundant IGP. Should mainstream boards start to roll out with IGPs on them (they used to a few years ago), having the option to combine the graphics processing of your discrete GPU along with what's already on-board would be a neat party trick and hopefully raise that bottom line closer to where us gamers sit at the top. Now if only I could combine my 800HP Porsche with my wife's Hybrid Honda and get those 10-second quarter-mile times with better gas mileage . . . ▲



Disrupting Reuters' newswire with a cheery Christmas greeting at age six, Alex "Sharky" Ross became an avid computer user/labuser, eventually founding popular hardware testing/review Web site SharkyExtreme.com. Exposing shoddy manufacturing practices and rubbish-spouting marketing weasels while championing innovative products, illuminating new technology, and pioneering real-world testing methods was just a front for playing with the best toys. The site acquired, he left in 2001. A London native and London School of Economics graduate, Alex currently overlocks/tunes Porsche 996 Turbos with www.sharkwerks.com when he's not tweaking PCs.

Email me at sharky@cpumag.com

PC Modder

Tips & Tutorials

Modding does the body good. A PC's body anyway, inside and out. Here you'll find hardware, firmware, tools, tips, and tutorials for modding your rig's performance and appearance. Send us your own mod-related tips and ideas at modding@cpumag.com.

Mods & Ends

Thermaltake Extreme Spirit II

To push FSB or HyperTransport frequencies to extreme limits, adequate chipset cooling is a must. The tiny heatsinks that are preinstalled on many of today's motherboards just aren't up to the task. Thermaltake's Extreme Spirit II (\$24.99; www.crazypc.com) is a flexible aftermarket northbridge cooler, giving your northbridge a boost, regardless of your motherboard.

The Extreme Spirit II boasts a copper construction with heatpipes, a polished base, and a 40 x 40 x 10mm (HxWxD), near-silent LED fan to provide efficient northbridge cooling. The Extreme Spirit II uses a universal clip design, so it should fit almost any motherboard. And the clip itself also rotates, so you can position the Extreme Spirit II's fan for the best possible airflow within your case. According to Thermaltake, the cooler's fan generates a mere 19dBA of noise, so it could also be quieter than your stock northbridge cooler.



The Thermaltake Extreme Spirit II's all-copper construction and mirrored base provide northbridge cooling that should eclipse stock chipset heatsinks.

Evercool H.D.D. Air Conditioner

Hard drives with high spindle speeds can be somewhat noisy, and many high-end models can also run quite hot. To tackle both of these problems (and potentially prolong the hard drive's life), Evercool has introduced the H.D.D. Air Conditioner (\$24.99; www.xoxide.com), an enclosure that fits in a 5.25-inch drive bay and can accommodate any standard 3.5-inch hard drive.

Mount a hard drive in the H.D.D. Air Conditioner, and the enclosure's 18dBA turbine fan provides active cooling. The enclosure itself isolates drive vibrations from the system chassis. A blue, backlit LCD temperature panel is mounted on the front of enclosure for real-time temperature monitoring, and a reusable dust filter is also included.



Quiet down and protect a noisy hard drive and actively cool it with Evercool EC-HDAC H.D.D. Air Conditioner.

Cooljag Mini LED Flash Fan

Sometimes a system just needs more bling. If you want to make your rig stand out at the next LAN party and personalize it in the process, Cooljag's Mini LED Flash Fans (\$20.99 to \$24.99; www.crazypc.com) may be just what the doctor ordered. Available in 80, 90, and 120mm diameter



Cooljag's Everflow Mini LED Flash Fans can be programmed to display any message up to 128 characters on their fan blades.

sizes, the fans feature a programmable flashing LED array that produces customized messages (up to 128 characters) on the fan's blades as they spin. The control software bundled with the fans also includes some simple graphics. And for the practical modder, the array can also display the current temperature on the fan blades. A couple of these puppies in a windowed case are sure to turn some heads.

Fashionably Fresh Firmware

D-Link DIR-655 Xtreme N Gigabit Router (v1.11)

D-Link has released a firmware update for the DIR-655 that improves DHCP WAN compatibility, expands the DHCP client table list, and utilizes the latest Widget version. The update also removes support for 802.11d but adds PPTp and IPSec ALG support.

www.dlink.com

Pioneer BDR-202 (v1.06)

A firmware update for the Pioneer BDR-202 internal DVD burner increases compatibility and write performance with a number of different types of recordable media.

www.pioneerelectronics.com

Netgear WNR854T (v1.4.31)

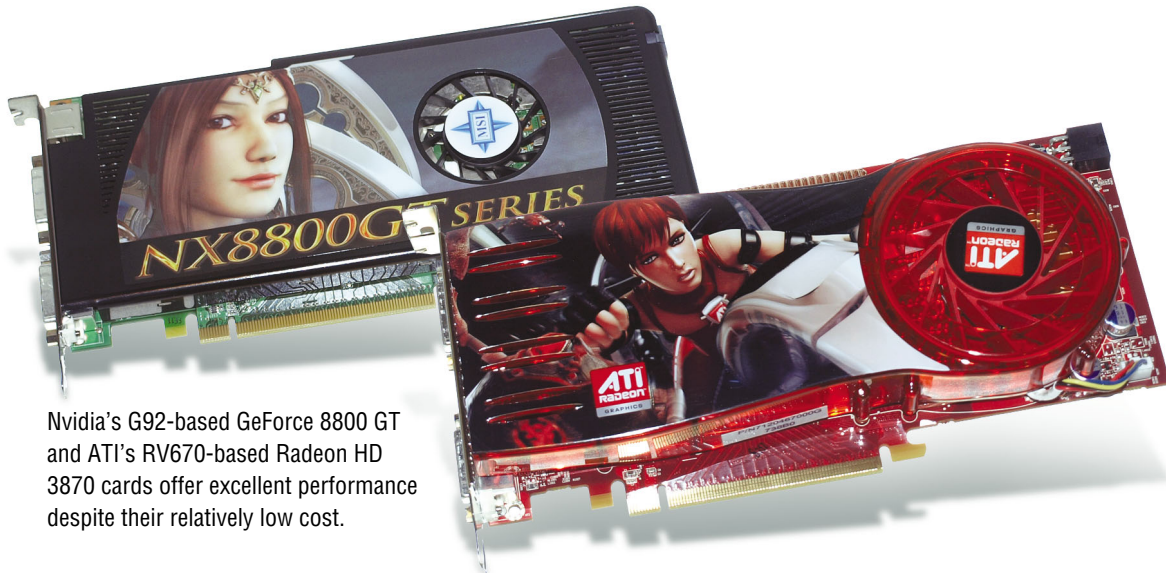
An update for the Netgear WNR854T broadband router fixes PPPoE disconnection problems and NAT issues with some SIP VoIP phones. Another bug fix corrects a problem with uploading an image to eBay when keyword blocking is enabled.

www.netgear.com

by Marco Chiappetta

Unleash The Beasts

G92 & RV670 Modded & Overclocked



Nvidia's G92-based GeForce 8800 GT and ATI's RV670-based Radeon HD 3870 cards offer excellent performance despite their relatively low cost.

Thanks to the recent efforts of both AMD and Nvidia, the mainstream graphics card market is brimming with high-quality products. The sub-\$250 graphics cards of today outperform even the high-end cards from less than two years ago. They have many more features, as well.

Of course, even with the relatively strong mainstream graphics cards available at the moment, we're always looking for ways to quickly and inexpensively increase performance. Lucky for us, it seems both AMD and Nvidia have built some headroom—which enterprising modders can easily unlock with minimal effort—into their current mainstream graphics card offerings.

For this issue, we've taken AMD's Radeon HD 3870 and Nvidia's GeForce 8800 GT and modded them to maximize overclockability for increased performance. We performed some basic cooling modifications on both cards to lower GPU and memory temperatures. We also volt-modded the Radeon to increase the overclockability of its RV670 GPU. Assuming you have the tools at your disposal already, you can do these mods essentially for free and in a minimal amount of time. Let's start with the GeForce.

GeForce 8800 GT Mod

A common complaint among many GeForce 8800 GT owners is that, under load, the GPU on their cards can get quite hot; sometimes in the neighborhood of 95 degrees Celsius. This is the main reason some of Nvidia's board partners, such as Evga, for example, have plans to release 8800 GTs with more powerful dual-slot coolers. This heat can also be a limiting factor when trying to overclock. However, there are a few things you can do to alleviate the problem without replacing the cooler.

After testing a number of 8800 GTs for a recent roundup, we found a couple of problems that no doubt hinder cooling performance. First, the reference fan shroud restricts air from freely escaping at the front of the card. We've also noticed compressed cooling pads on some of the RAM chips protruding into the area beneath the fan and found an excessive amount of TIM (thermal interface material) applied on the GPU. Thankfully, all of these things can easily be fixed.

Pull It Apart

For our GeForce 8800 GT mod, we used a screwdriver, a pair of sharp wire

snips, a bit of metal polish, and some high-quality, diamond-based thermal paste. First, we removed the cooler from the card. We did this easily by removing a handful of screws on the back of the PCB and carefully pulling up on the cooler. We were careful not to yank it off at an angle that would damage any small components underneath.

With the cooler removed, you'll see thermal pads on each RAM chip and a large amount of TIM on the underside of the heatsink. Most of the thermal pads on the RAM should be fine; you may need to trim the two that reside under the fan so they don't interfere with the underside of the fan. This may sound counterintuitive, but if the pads are protruding over the chips and off of the heatsink, that excess material isn't helping cool things down.

Next, we cleaned up all of the stock TIM used on the GPU. On our card (and we suspect most others), the layer of TIM that covered the entire base of the heatsink was very thick. We cleaned it up and, while the cooler was removed, used the opportunity to polish the heatsink's base with some wadding metal polish. Although the base had a near-mirror finish already, it doesn't hurt to remove

some of the minor imperfections. Once we cleaned and polished everything, we applied a very thin layer of high-quality, diamond-based thermal paste to just the GPU die. Don't spread thermal paste over the entire base of the heatsink.

Finally, we moved on to the 8800 GT's fan shroud. Because the 8800 GT's

reference cooler is only a single-slot design, it isn't set up to exhaust hot air. Instead, the fan just blows air across the heatsink and recirculates it back into the case. The problem is that the area at the front of the card where the air is supposed to exhaust is somewhat cramped. We remedied the situation by cutting away a

portion of the shroud. This may sound difficult, but the aluminum was so thin that we just crimped it with the wire snips and broke it off by hand. We followed the curved line of the underlying heatsink fins all the way up to the top of the card, removing a fair amount of metal in the process.

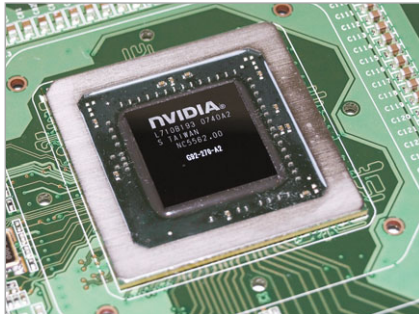
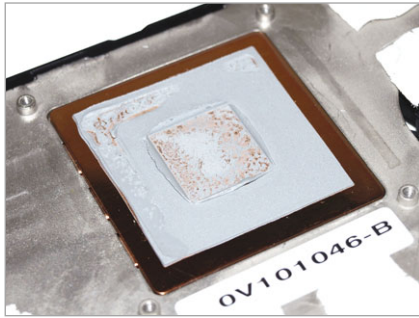
Performance: Before & After The Mods

To see what kind of effect the mods had on the GeForce 8800 GT and Radeon HD 3870's performance, we ran a number of benchmarks and compared the results to the stock cards and high-end cards from both camps. Our test system for all of the benchmarks featured an Asus P5E3 Deluxe motherboard, an Intel Core 2 Extreme QX6850 processor, and 2GB of Corsair RAM. For software, we installed Windows Vista Ultimate 32-bit and the November 2007 DirectX update. Finally, we used the latest drivers available for both cards—Nvidia's ForceWare v169.28 and ATI's Catalyst v8.1.

Unfortunately, despite decent overlocks from both the GeForce 8800 GT and the Radeon HD 3870, we weren't able to bring their performance up to the levels set by their more powerful (but more expensive) counterparts. However, both cards enjoyed sizable performance gains, and the GeForce 8800 GT came close to matching the GeForce 8800 GTX's performance. (We didn't expect the overclocked Radeon HD 3870 to rival the dual-GPU-powered Radeon HD 3870 X2.)

Regardless, considering the 8800 GT and 3870 cost substantially less than their respective higher-end siblings, the free performance available after some basic modding and overclocking makes either midrange card a great value to PC enthusiasts.

GeForce		GeForce 8800 GT Stock	GeForce 8800 GT (Overclocked)	GeForce 8800 GTX
Core clock		660MHz	740MHz	575MHz
Memory clock		950MHz	1,070MHz	900MHz
3DMark06 (Default)				
Overall Score		12533	12940	12962
Shader Model 2.0		5004	5196	5288
Shader Model 3.0/HDR		5349	5463	5540
Half Life 2: Episode 2				
1,600 x 1,200		88.57	95.74	100.31
1,920 x 1,200		74.29	78.37	81.97
Company of Heroes				
1,600 x 1,200		33.4	38.3	44.8
1,920 x 1,200		24.2	27.9	27.1
Quake Wars: Enemy Territory				
1,600 x 1,200		63.6	67.8	69.6
1,920 x 1,200		54.3	57.8	59.3
*Games tested with 4XAA/16XAF.				
Radeon		Radeon HD 3870	Radeon HD 3870 (Overclocked)	Radeon HD 3870 X2
Core clock		775MHz	865MHz	825MHz
Memory clock		1,126MHz	1,300MHz	900MHz
3DMark06 (Default)				
Overall Score		11532	12189	15155
Shader Model 2.0		4358	4632	5976
Shader Model 3.0/HDR		4970	5281	7191
Half Life 2: Episode 2				
1,600 x 1,200		63.66	71.23	118.95
1,920 x 1,200		54.2	59.87	101.29
Company of Heroes				
1,600 x 1,200		28.1	34.2	41.1
1,920 x 1,200		22.9	25.1	34.6
Quake Wars: Enemy Territory				
1,600 x 1,200		50.2	58.6	77.7
1,920 x 1,200		42.9	49.8	67.7
*Games tested with 4XAA/16XAF.				



Our GeForce 8800 GT had too much thermal interface material applied at the factory. By cleaning it up, polishing the heatsink's base, and applying a high-quality TIM, heat is more quickly drawn from the GPU, which reduces its temperature.

Put It Back Together

With all of the mods complete, we reassembled the card and checked the GPU temperature before overclocking. Before the mod, our particular card hit 92 C after about 30 minutes of gaming. After the mods, however, the GPU temperature never broke 85 C. It wasn't an earth-shattering difference, but significant nonetheless.

Next, we moved on to overclocking the card using Nvidia's nTune utility. We were able to take the card's stock GPU and memory speeds of 660MHz and 950MHz, respectively, to 740MHz and 1,070MHz. These impressive overclocks paid dividends in the benchmarks, as you'll see a little later.

Our Rad Radeon Mod

One of the Radeon HD 3870 mods we performed was a bit more technical. For the Radeon mods, we used all of the same tools but swapped the wire snips for a digital multimeter and grabbed hold of a

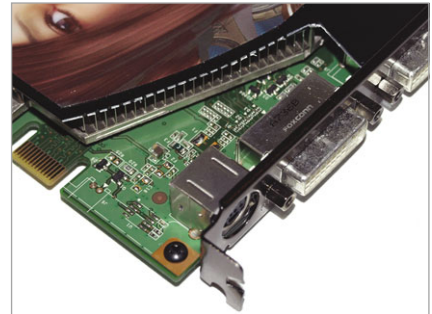
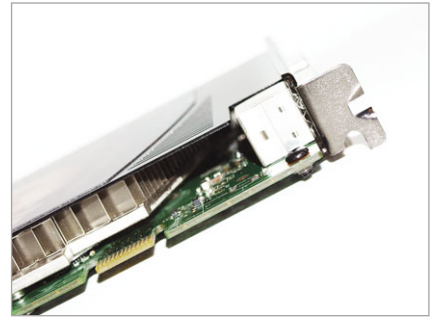
pencil. Our first order of business was replacing the stock TIM on the GPU and polishing the heatsink's base, following the same procedures we used earlier for the GeForce. Heat isn't generally an issue with the Radeon HD 3870, thanks to its 55nm GPU and dual-slot cooler that exhausts hot air from the system, but every degree helps when overclocking. And because we were volt-modding the card, we wanted to enhance its cooling performance as much as possible.

We've done a number of volt mods in the past, a few of which required soldering potentiometers onto a board or modifying its BIOS. With the Radeon HD 3870 (and 3850), however, increasing the voltage to the GPU is much easier. If you look at the backside of the PCB, you'll see a row of four square solder joints near the edge of the card. At these points, you can check your card's stock GPU voltage. With your system running, ground your multimeter's negative lead to your case and probe each of the four points with the tip of the meter's positive lead. If your card is based on ATI's reference design, you should see a stock voltage of 1.33V. (This may vary by a few hundredths of a volt.)

Once we measured our card's stock voltage, we shut down our system and removed the card. On the back of the card, about an inch away from the two upper solder joints, there is a row of resistors, the first of which is labeled R1222. This resistor is used to help determine the GPU's supply voltage.

In its stock configuration, the R1222 resistor should measure between 1.5k and 1.6k ohms. Using the multimeter, carefully measure across the R1222 resistor; ours read 1.56k ohms. If you reduce this resistor's resistance, however, the voltage supplied to the GPU will increase. Our goal was to get the resistance down to about 1.1k to 1.2k ohms, which would increase the GPU voltage to about 1.4V. Lowering the resistance more would've resulted in an even higher voltage, which we wouldn't be comfortable using with a stock GPU cooler.

To lower the resistance of the R1222 resistor, all you need to do is pencil lines



By removing the entire end portion of the shroud, air can more freely flow away from the heatsink and card.

along the top of the resistor. We recommend drawing a couple of heavy lines and then retesting the resistance until you hit about the 1.1k-ohm mark. Then, reinstall the card and recheck the GPU's supply voltage as soon as the system has power. If it is higher than 1.4V, shut down the system, clean up the pencil marks, and start again. Also, be mindful of the excess pencil dust. The dust is electrically conductive and should be blown off of the card before reinstalling it into your system.

Increase The Clocks

When you've lowered the resistance to the proper range and are certain that the GPU's supply voltage is hovering around the 1.4V mark, it's time to overclock your card. For Radeon overclocking, we like to use ATITool because of its automated maximum frequency finder and artifact tester. We took our stock Radeon HD 3870's GPU and memory from 775MHz and 1,126MHz, respectively, to 865MHz and 1,300MHz. That's a lot of extra clock speed for a little bit of effort. ▲

by Marco Chiappetta

**2.5" / 3.5" SATA HDD USB Docking Station
SUPPORT UP TO 1TB (10,000GB) H.D.D.**



* Hard Drive not included

Revolutionary, maybe not. Innovative? Most definitive. The all-new Thermaltake BlacX Series Hard Drive Docking Station takes data mobility and accessibility to a whole new level. Inter-cubicle data transfer or inter-dorm room movie/song/album transfer has never been so easy. All BlacX Series Hard Drive Docking Stations support either 3.5" desktop or 2.5" laptop Serial ATA (SATA) hard drives.

For more detail information on the all-new BlacX Series Hard Drive Docking Stations, visit www.thermaltake.com.



Mad Reader *MOD*

Can You Digg It?

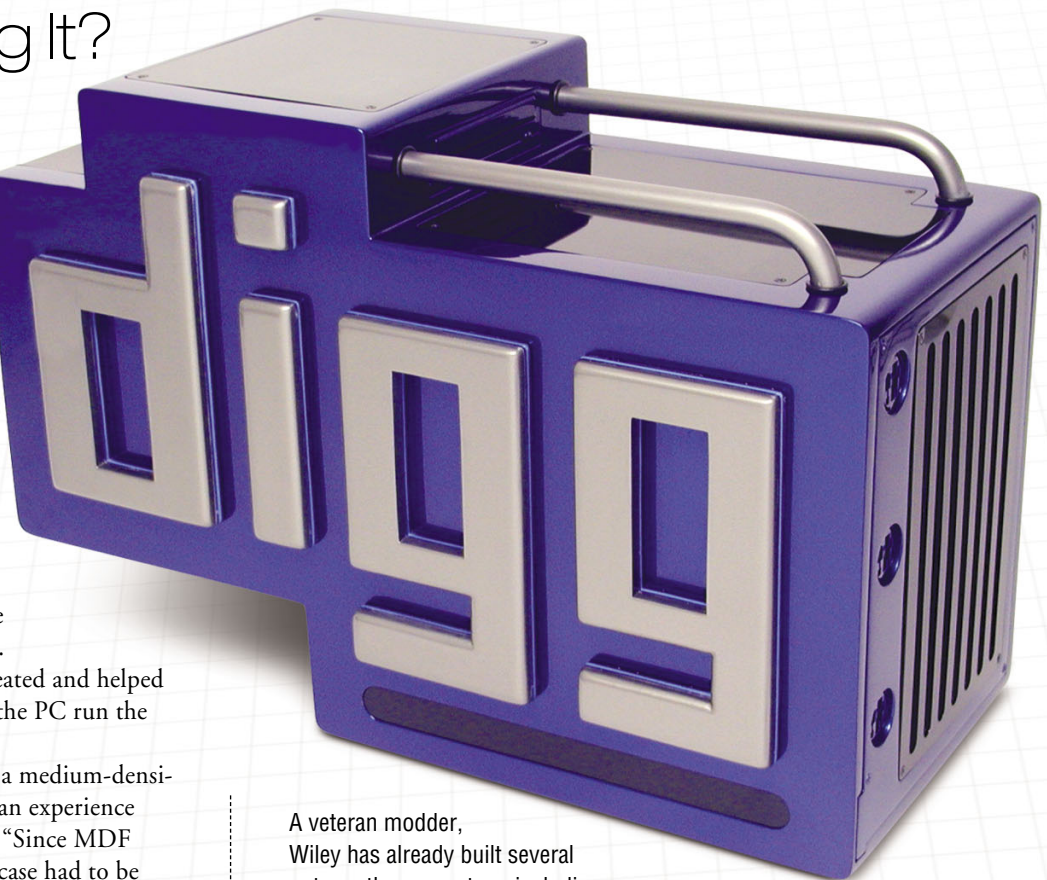
Call us crazy, but we think Alex Wiley likes the popular social news bookmarking Web site Digg. "I built this case mainly to show off what can be done (in terms of custom cases) for simple logos," Wiley says. "Digg is also a favorite site of mine, and the owners were helpful in getting me any artwork I needed."

Digg lovers will enjoy more than the Digg Custom Case's shape and backlit lettering. A Noritake Message Display Module runs the Digg news ticker when the system is connected to the Internet. LcdStudio.com forum members created and helped troubleshoot the software that lets the PC run the Digg news ticker.

The Digg Custom Case features a medium-density fiberboard chassis. "It was quite an experience sealing it up properly," says Wiley. "Since MDF absorbs quite a bit of material, the case had to be sprayed with polyester primer, regular primer, sealer, and finally basecoat/clearcoat. Each step required a lot of sanding, especially on the inside of the case."

Of course, the Digg Custom Case is more than a case mod. Wiley completely overhauled the 580W Hiper power supply by extending some of the cables to an outlet at the motherboard tray. He used gray pipes to hide the wiring that led to the hard drives and optical drive.

As head of modding business Computer Choppers in West Linn, Ore., Wiley already has exciting new mods in the works, some of which require more exotic materials than others. By the time you read this, he will have finished a 24k gold-plated MacBook Pro that features a diamond-studded Apple logo. And as for Digg's fate: Wiley plans to sell it at the time of this writing. "I don't typically sell my pet projects, but I get quite a few emails every month asking about it," Wiley says. "I decided to sell it so I could start another big project." Digg in. ▲

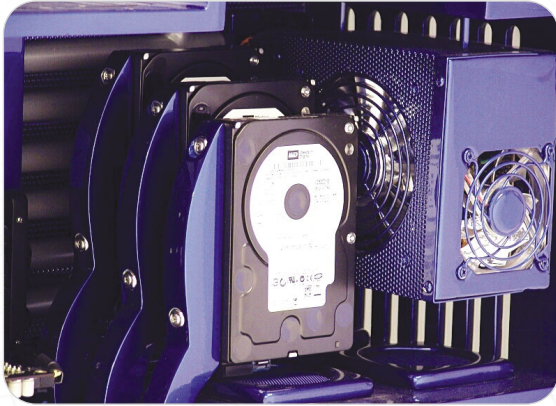


A veteran modder, Wiley has already built several noteworthy computers, including a "Batman Begins"-themed HTPC. "In general, my inspiration comes from pop culture," Wiley continues. "I've got a mountain of ideas I've drawn up sitting on my desk for future use. Most are my own art, but some logos still look fun to build. This is just the tip of the iceberg in terms of cases."



The power buttons and USB ports sit on the side of the system, below the lit letters. Wiley modified the PSU so that its power switch is on the same panel.

by Joshua Gulick



Standoffs at the side of the case hold the power supply so that it appears to float. "The hard drive mounts took a variety of shapes and sizes in the design stage. I settled on the cascading, singled-sided mount in case I did any mods to show off the drive face. In the end, I didn't do anything to change the drives but would have liked to use windowed drives instead."



"The newsticker is the best part of the case, hands down," says Wiley. "It took a lot of collaboration with various people to get the software synced to the display, and it worked perfectly in the end."



Several 40mm fans cool the Digg Custom Case's CCFL light box. Wiley used a Digg graphic to create the grille for each of the fans.



Wiley created a light box that contains eight cold cathode lights. "Having a light box allowed me to disperse the light evenly behind the lettering," says Wiley. "The only problem the light box creates is heat. To counter that, I installed three small fans in the back of the case that take air directly out of the box."



The optical drive sits at the top of the case and opens between the two chrome bars. "All of the windows are made from 1/8-inch bronze acrylic," says Wiley. "I cut and polished each of the windows using a band saw."

Give Us Your Mod

Have a computer mod that will bring tears to our eyes? Email photos and a description to madreaderm@cpumag.com. We're looking for rigs that are recognizable as PCs; your Wookiee mod won't find a home here. If we include your system in our "Mad Reader Mod" section, we'll help you load up your modder's toolbox with \$1,500 and a one-year subscription to *CPU*.

advanced Q & A corner

Get informed answers to your advanced technical questions from *CPU*. Send your questions along with a phone and/or fax number, so we can call you if necessary, to q&a@cpumag.com. Please include all pertinent system information.

“ The more
performance and
power you have
under the hood, the
greater the heat and
noise will be. ”

Each month, we dig deep into the mailbag here at CPU in an effort to answer your most pressing technical questions. Want some advice on your next purchase or upgrade? Have a ghost in your machine? Are BSODs making your life miserable? CPU's "Advanced Q&A Corner" is here for you.

Larry S. asked: Over a year ago, I decided that our 7-year-old Dell computer probably would not make it too much longer, so I started reading every computer magazine available with the thought of building our own computer. My wife uses the computer every day, for things related to her job as an RN and for email, family pictures, banking and buying online, etc.

After reading everything I could, I reached a decision on components for our new computer in January 2007. Then in February 2007, I read the March "Advanced Q&A" section in *CPU Magazine*, and my jaw dropped! The answers you gave Alan M. were the exact components I wanted. I was sold, not only on your magazine, but also CyberPower, who could put all these components together for under \$2,000:

- CoolerMaster case w/ liquid cooling
- 500W PSU
- Core 2 Duo E6600
- Asus P5W DH Deluxe
- Corsair 2GB DDR2-800 RAM
- Evga GeForce 8800 GTS
- Two 320GB hard drives (RAID 1)
- Windows Vista Ultimate

We love the computer. It's worked great since we acquired it at the end of March 2007. We had some minor problems, but those were because of Windows Vista—driver stuff mostly.

We shut off the old Dell computer when we got the new computer running and have not touched it since. We were thinking about getting rid of it until reading an article about using an old computer, with a little work, as a "home server" for backup purposes.

Do you think it would be worth it? Do you think there would be any ill effects using the old machine to back up our new computer? My thoughts are about putting two new hard drives in the old computer in a RAID 1 configuration and tying it in with the new computer. Is this possible?

Here are the specs for the old computer:

- Dell Dimension XPS
- Pentium III 1GHz
- 512MB RDRAM (PC800)
- 45GB Ultra ATA 7,200rpm EIDE
- 64MB DDR Nvidia GeForce 2 GTS 4X
- Windows Me



External hard drives such as the Western Digital My Book or Seagate FreeAgent include easy-to-use software for automating backups from a PC.

A: First off, Larry, we're glad the magazine helped you to choose the components for your new rig. We like to think we're here to help, so it's always good to hear that our advice was taken to heart by a reader and things worked out well. Thanks for the kudos. As for your question about using your old PC as a server, yes, absolutely that could work. In your particular instance, however, we think you may be better served by an external hard drive or maybe even a NAS (network-attached storage) device.

Your old PC is definitely powerful enough to use as home server, but considering its age and the operating system installed on it, at the very least, you'll likely need to add a RAID controller (or run software RAID) and replace the operating system to do it "right." There are a multitude of inexpensive RAID controllers on the market, and if you're up for the challenge of learning a new operating system, just about any flavor of Linux could be used on this machine for free. However, couple the upgrade hassle with the possible expense of the controller and the definite expense of the new hard drives, and an external hard drive becomes a much more attractive option. From the tone of your note, it also sounds like you have only a single PC in the house. If that is in fact the case, you must also factor in the cost of a network switch or hub to connect the new machine to the old machine.

There are many name-brand USB 2.0/eSATA external hard drives available with capacities around 500GB for about \$120 that include automated backup software. A product such as a Western Digital My Book or Seagate FreeAgent could serve your backup needs very well. If you'd prefer something a little more robust that has support for RAID 1 (mirroring), external drive arrays with capacities of 500GB to 1TB are also available, but for a considerably higher price tag somewhere in the range of \$250 to \$450.

We should also note that NAS devices with similar functionality, software, capacities, and features are available, as well, with the added benefit of being able to access them from any machine on the network. Should you already have a network switch in your home as part of a broadband router, we'd also advise looking into a NAS device as a possible solution to your problem. As cool, and potentially educational, as it might be to resurrect your old machine and reconfigure it as a home server, sometimes it's just better to keep things simple. ▲

by Dave Altavilla and Marco Chiappetta,
the experts over at HotHardware.com

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HighSpeed PC Specialty Computer Hardware

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AGP/PCI Support Brace



ATX Control Kit

www.highspeedpc.com

AMD Spider

Even though Intel has released a few different computing platforms (most notably Centrino and Viiv), and AMD had never released a platform, AMD's recent announcement of the Spider platform isn't quite a case of "if you can't beat 'em, join 'em."

Spider differs from Intel's platforms because of its components: a Radeon GPU paired with an AMD quad-core processor (Phenom) and an AMD chipset (7-Series). None of Intel's platforms have included a video card with the chipset and processor, instead offering various networking options.

Not surprisingly, by emphasizing graphics with the platform, AMD is aiming Spider at computer gaming and HD enthusiasts.

Efficient Setup

The idea behind a platform is that the components will work more efficiently together because they're from the same company and they've been tested together. AMD's acquisition of ATI in mid-2006 contributed to the company's decision to offer its first-ever platform. But mostly, AMD thought the timing was right to debut a platform.

"We are moving toward platforms," says Patrick Moorhead, vice president of advanced marketing. "They serve our customers very well, particularly in the enthusiast space. . . . Enthusiasts aren't just the guys buying \$4,000 rigs. They're people who are enthusiastic about their computers."

AMD began designing Spider soon after the acquisition of ATI. Moorhead says AMD sees the Spider platform as the combination of a gaming computer and a home-theater computer.

"We thought more people would want that in one machine," he says. "If they love

Spider Overview

Until Spider, AMD had never released a platform. However, with AMD's acquisition of ATI and with the types of technology now available, AMD's Moorhead says the timing is right for AMD's Spider platform.

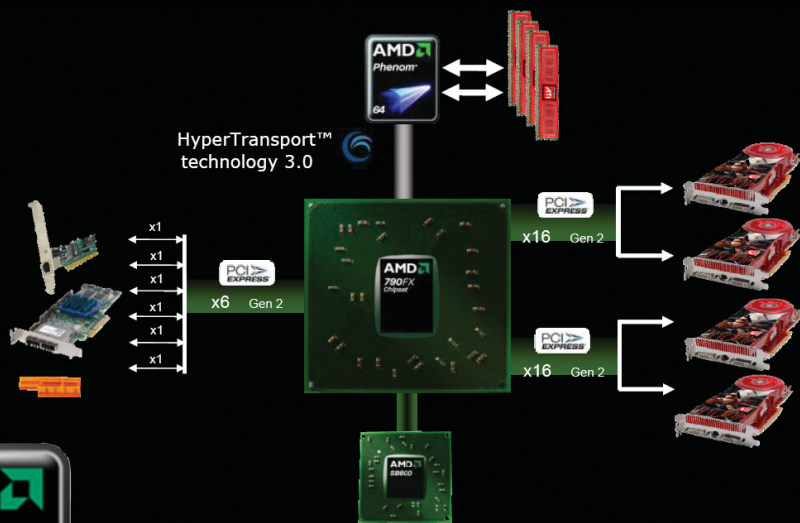
"It just made a lot of sense" after AMD acquired ATI, he says. "We're in an age of video. People are either watching it, or editing it, or sharing it. We think that's a good thing. [With the Spider platform,] the quality of the video is great."

Spider consists of three basic elements: The 7-Series chipset, the Radeon GPU, and the Phenom CPU.

7-Series chipset. With the 7-Series chipset, AMD is offering complete support for quad-core processors and high-end graphics. The chipset includes HyperTransport 3.0 technology, as well.

With up to 42 PCI-E 2.0 channels available, the 7-Series chipset supports high-end graphics capabilities, including the use of up to four Radeon video boards at one time.

"Sometimes, the chipset is treated like the [forgotten aspect] of the platform, but it's really the shining star for us," Moorhead says.



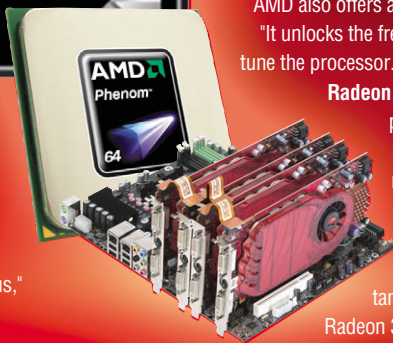
Phenom. With its four cores, the Phenom CPU offers a lot of power. "It's the first native quad-core out there," Moorhead says.

AMD also offers a Black Edition Phenom chip, aimed at high-end users.

"It unlocks the frequency multiplier," Moorhead says. "You can more easily tune the processor."

Radeon. We discussed the Radeon 3800 series graphics processor in detail in the February issue of *CPU*. It's the first GPU to use a 55nm manufacturing process and to include DirectX 10.1 support. CrossFireX

allows you to simultaneously use up to four Radeon 3800 series boards. ▲



putting it together and tweaking it, this will appeal to them. This is a strategic move for AMD to cater to the enthusiast market."

Spider & Scalability

The Spider platform provides benefits in three key areas: HD performance, scalability, and energy efficiency.

HD. Spider supports both DX10.1 and PCI-E 2.0. The large amount of data required to create HD video and images requires lots of bandwidth, which PCI-E 2.0 can provide.

Scalability. With the Spider platform and CrossFire technology, users can scale their computer systems to use multiple video cards. Users also can use AMD OverDrive technology to control the performance level of individual components within the system. Finally, Spider will allow for upgrades in the future

because AMD will be using the same sockets through 2009.

"We can ride that architecture well into the future," Moorhead says. "Scalability is huge. To expect the enthusiast to throw everything out [by changing architecture], we think is a bad idea. . . . With Spider, we're saying our new processors in 2008 and 2009 will be compatible with the socket. They will be backward-compatible."

Energy efficiency. With PowerPlay technology in the Radeon video cards, AMD was able to cut GPU power consumption by 50% when running at peak performance and by 75% when idling. Lower power requirements mean the GPU is generating less heat, which causes less overall system noise from cooling components.

"It's really good performance per watt and per decibel," he says.

With the low power consumption requirements for Spider and with recent AMD announcements concerning the Mobility Radeon series, Spider may expand beyond the desktop environment at some point.

"It potentially could be used for enthusiast notebooks," Moorhead says.

Next Up: Leo

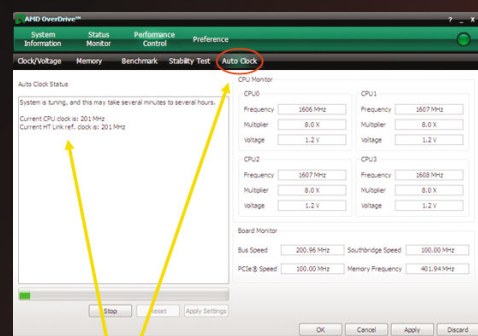
As an upgrade to Spider, AMD is planning to release the Leo platform in 2009, featuring a 45nm manufacturing process, as well as upgraded GPUs.

"We're constantly planning the next generation, as well," Moorhead says.

It's safe to say Spider may be AMD's first platform, but it won't be the company's last. ▲

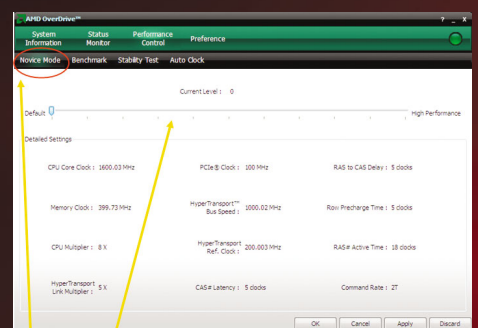
by Kyle Schurman

AMD OverDrive



Auto Clock

The Auto Clock mode automatically measures the overall system performance, determining the optimum settings.



Novice Mode

With Novice Mode, one slider bar gives the user an opportunity to manually set the performance level of the overall system

Most of the time, overclocking, system tuning, system measurements, and system monitoring are processes reserved only for expert users. AMD certainly hasn't forgotten the high-end users with its OverDrive utility (part of the Series 7 chipset).

But OverDrive also offers some features aimed at introducing novice users to the idea of maximizing system performance.

"It's like a 747 dashboard for tuning," AMD's Moorhead says of OverDrive. "We want to get people enthusiastic about it. Some may want to extract every ounce out of their rig, but maybe they're afraid to try it themselves."

OverDrive caters to users with varying levels of experience through three modes: Auto Clock, Novice Mode, and Advanced Mode.

In Auto Clock mode, the system determines the optimum settings.

In Novice Mode, users can use a sliding bar to determine the level of performance for

the system as a whole.

In Advanced Mode, expert users can adjust the level of performance for up to 40 components and processes individually, using slider bars and text boxes.

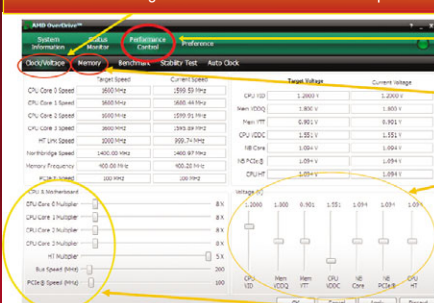
"You can track all of that in one control panel," Moorhead says. "You can do a lot of stuff through BIOS, but the only way to do it all in an understandable way is with OverDrive."

Some might question the decision to include a Novice mode in a platform aimed at the enthusiast market, but Moorhead says AMD had some key reasons.

"We feel there are user needs for it," he says, "and we need to help the market grow. With this, we can help expand the size of the enthusiast market. A lot of people would like to get into it, but they feel overwhelmed. . . . Not everybody can handle the Advanced mode. They might aspire to get there, but they aren't there yet." ▲

Advanced Mode

The Clock/Voltage window, displayed here, gives you access to the settings for the CPU cores and the chipset



The Performance Control area of OverDrive gives you access to several adjustable settings

Clicking here allows you to switch to the Memory window, where you can adjust the memory settings

Use the voltage tuning slider bars to adjust clock speeds in several areas

You can adjust the CPU and chipset tuning using these slider bars

Nvidia's Hybrid SLI

Saving Power One GPU At A Time

High-end video cards and GPUs provide tons of benefits and cool features. They make it possible to play the best and latest games. The trade-off? The cards require tons of electricity to operate. High power requirements, obviously, are rough on laptops running on batteries. But high power requirements

can be rough on desktops, too, generating extra heat and creating noise from taxed cooling systems and power supplies. Yet as more gamers move toward systems with multiple video cards, the electrical requirements will only increase.

Nvidia recently announced a new technology, called Hybrid SLI, aimed at

lowering the system's power requirements, even when operating a high-end graphics system.

The Improvements

High-end GPUs require a large amount of electrical power even when idle. Because users spend a lot of time

Performance vs. Low Power

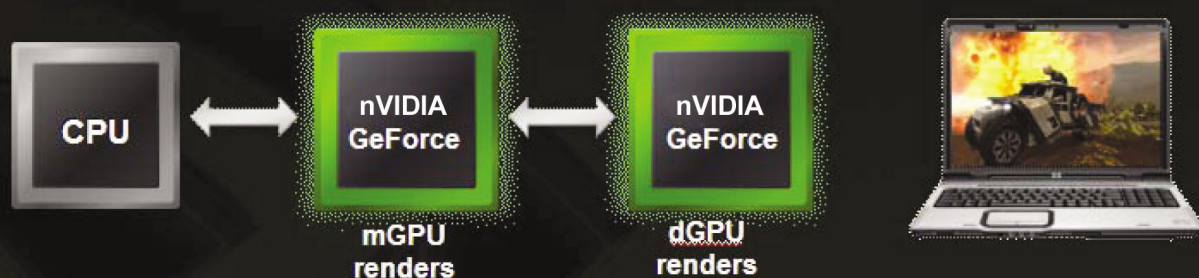
Hybrid SLI consists of two components: GeForce Boost, which can provide greater graphics performance, and HybridPower, which provides power savings when performance needs are lower.

GeForce Boost/Performance. You could use the GPU on a video card (the discrete GPU, or dGPU) in combination with the integrated GPU on the motherboard (or mGPU) to achieve the best possible performance when running a complex game, such as Crysis.

HybridPower/Low Power. When later using an application that's not graphics-intensive, such as an email client, you could shut down the dGPU, moving all rendering to the mGPU. The mGPU requires less power to operate.

"You can see a dramatic change in the amount of power your GPU is using," Nvidia's Henry says. "You could add another hour of battery life." ▲

Performance/GeForce Boost



Low Power/HybridPower



Source: Nvidia

running software that needs minimal graphical requirements—email or word processors, for example—the large power demands of high-end GPUs during idle times has become problematic.

In announcing Hybrid SLI early in 2008, Nvidia unveiled plans to begin including an integrated GPU with all Nvidia chipsets. Whether users select an Nvidia video card containing a low-end GPU or a high-end GPU, Nvidia ensures the system will also have an integrated GPU. With at least two GPUs available in every Nvidia system, Hybrid SLI becomes possible.

In the recent past, integrated GPUs (which Nvidia also calls motherboard GPUs, or mGPUs) usually only appeared on low-end motherboards. The mGPUs were aimed at low-cost motherboards and computing systems, usually because they would serve as the system's only GPU. Video cards with high-end discrete GPUs (what Nvidia calls dGPUs) weren't made for low-end systems.

However, with graphics cards and dGPUs now appearing in nearly all

systems, Nvidia's Hybrid SLI will take advantage of the mGPU's presence to conserve power, using a technology Nvidia calls HybridPower.

HybridPower

HybridPower obtains its significant power savings by completely shutting down the dGPUs whenever they aren't needed. When the less powerful (and less power hungry) mGPU can handle the system's graphics needs by itself, HybridPower shuts down all dGPUs, meaning they are draining no power.

"Hybrid SLI allows the products to work in SLI mode, and you can choose which of the two GPUs you want to run," says Drew Henry, general manager of Nvidia's MCP business unit.

Early demonstrations of the Hybrid SLI system using HybridPower indicated a power savings with a powered-down dGPU of between 100 and 120 watts vs. an idled dGPU. Lower power consumption means less overall system heat. Even though the cooling fans on the video cards themselves aren't overly noisy



anymore, "power supplies are still noisy," Henry says. "The whole system can go into a quieter mode."

GeForce Boost

Hybrid SLI also can give a boost to certain dGPUs by allowing the mGPU and the dGPU to work in tandem through a process called GeForce Boost.

"It's a cooperative operation between the GPUs on the motherboard and on the card," Henry says.

However, GeForce Boost isn't going to provide much benefit to the enthusiast portion of the market, as the significant

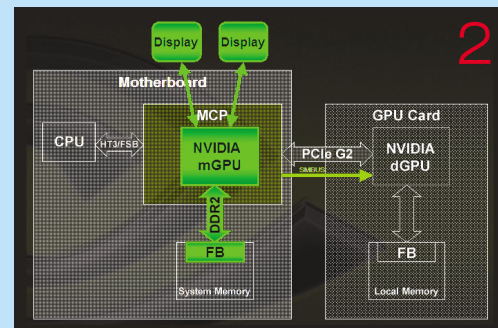
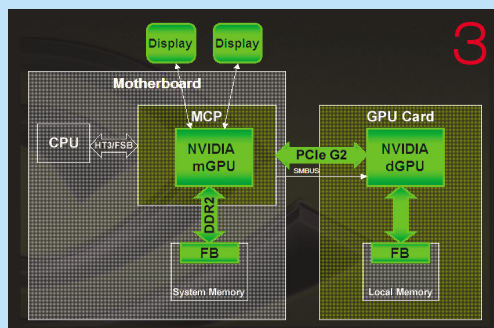
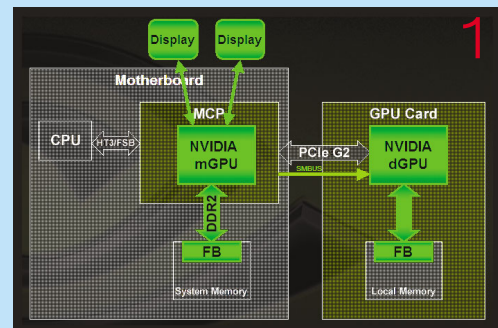
HybridPower

With HybridPower, users can save power, reduce noise, and reduce heat within the graphics system.

- 1 The mGPU and the dGPU can work together to provide high-end graphics rendering, storing the rendering output in the associated FB (frame buffer).
- 2 When the graphics requirements are minimal and the mGPU can handle them alone, the motherboard uses the SMBus (system management bus) to send a signal to the dGPU, telling it to power down, which saves overall system power. The SMBus is a bus interface that Nvidia uses for communications between the GPUs on the motherboard and the video card.

The dGPU must have Hybrid SLI technology built into it to allow HybridPower to work.

- 3 When the mGPU again requires help from the dGPU to render complex graphics—or when the dGPU needs to render graphics alone—the system uses the SMBus interface to tell the dGPU to power up again, and the two GPUs share data over PCI-E. ▲



Source: Nvidia

difference in features and processing power between the mGPU and a top-of-the-line dGPU makes it counter-productive for the two chips to work together.

When using an older or low-end dGPU with the mGPU, which would be similar in power requirements and capabilities, GeForce Boost will allow the GPUs to work more in tandem, Henry says.

More Changes Coming

Finally, it's worth noting that this initial configuration of Hybrid SLI will surely undergo some serious changes. For example, Hybrid SLI initially will not support multiple digital displays.

Henry says it might be as long as 24 months before Hybrid SLI has all of the features Nvidia's engineers would like to see. However, you can expect the technology to morph and evolve quickly.

"The core logic in GPUs has allowed us to evolve to where we're doing special things," Henry says. ▲

by Kyle Schurman



GeForce Boost

With GeForce Boost, high-end 3D applications will make use of both the mGPU and the dGPU. By using the two GPUs in tandem, the already powerful dGPU gains an additional boost in rendering capabilities.

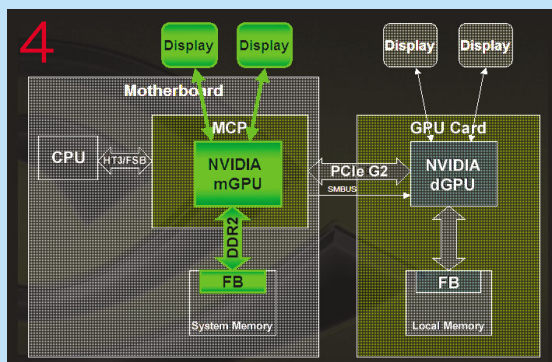
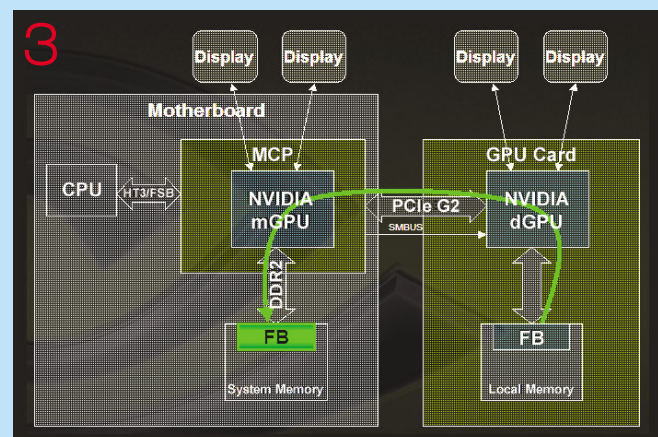
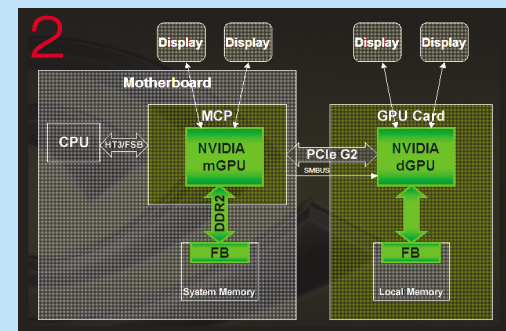
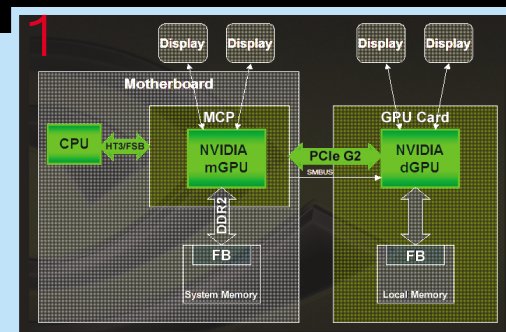
1 To avoid latency issues, the Hybrid SLI drivers split the workload, giving each GPU a percentage of the workload it can handle most efficiently. The dGPU could end up with a slightly larger share of the workload because it's a more powerful GPU than the mGPU. However, GeForce Boost would not be useful when the difference in processing power between the two GPUs is too large because it would create latency and cause more problems than it would fix.

2 As each GPU renders its share of the frames, it stores the data in its FB (frame buffer).

3 Using a block transfer, the dGPU sends its rendered images to the mGPU's frame buffer.

4 The mGPU then sends the frames to the display. By using the mGPU as the output source, the system can switch easily between the two GPUs. Under this system, the motherboard will contain the output connections. During demos, Nvidia has shown a motherboard with DVI, HDMI, and VGA connectors.

"When you do something that doesn't require that kind of high-end performance . . . this motherboard has a display output on it," Nvidia general manager Drew Henry says. "You don't have to swap cables." ▲



Source: Nvidia

Controlling HybridPower

In its initial configuration, users will need to manually make HybridPower work by either turning off or starting up the dGPU.

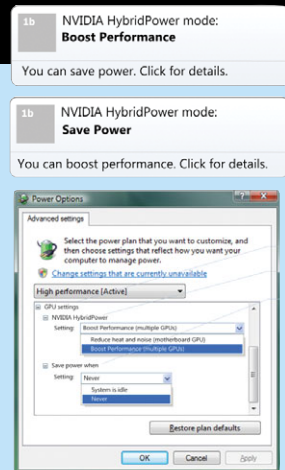
Nvidia uses a System Tray icon and pop-up windows to provide users with information on when a change in the HybridPower settings would be advantageous (as shown above).

You also can set Windows Vista's Power Options to automatically determine when to use both GPUs and when to save power and use only the mGPU (as shown at right).

In future iterations of HybridPower, Nvidia hopes to make the technology more automatic,

requiring much less, if any, user input. For example, the system would sense when a graphics-intensive application is running, and it would start the dGPU automatically.

"Right now, you can toggle [power to the dGPU] manually, or if Windows is in idle mode or low power mode, it'll shut off the dGPU," Henry says. "The long-term goal is this becomes more application aware. . . . Absolutely, this is our first generation. The interfaces are more manual now than they will be in future generations." ▲

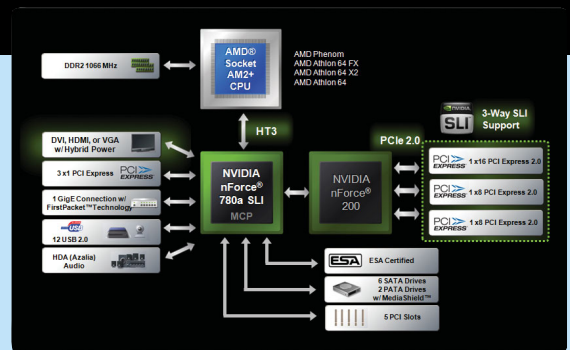


Source: Nvidia

Nvidia 780a SLI Architecture

Nvidia is aiming the 780a SLI MCP at the enthusiast market. It features ESA and three-way SLI support. (ESA, or Enthusiast System Architecture, is an open-standard protocol for monitoring and controlling the system's thermal, electrical, acoustic, and operating characteristics.) It also supports both aspects of Hybrid SLI: GeForce Boost and HybridPower.

However, support for GeForce Boost isn't as important with this high-end architecture because of the large gap between the capabilities of the mGPU and the dGPU. ▲



Source: Nvidia

Broadcast vs. PW Shortcut

Two new Hybrid SLI-related technologies from Nvidia, Broadcast and PW Shortcut, help the graphics system by reducing latency and by improving efficiency. They only work with Nvidia GPUs working in SLI mode.

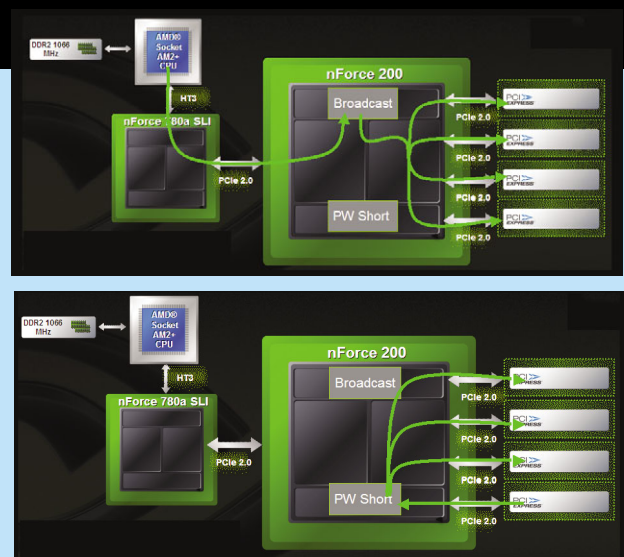
Broadcast. Nvidia built the Broadcast technology directly into the nForce 200 portion of the chipset. Broadcast allows the system to write data from the CPU and system memory directly to each of the GPUs with one command.

The Broadcast feature conserves PCI-E bandwidth, and it allows the system to make the most of each CPU cycle.

"It goes from system memory, one copy goes to the SLI chip and then to all GPUs," Henry says. "It's a very efficient bandwidth architecture."

PW Shortcut. As with Broadcast, PW Shortcut is a technology Nvidia built into the nForce 200 portion of the chipset. PW Shortcut allows one GPU to share its data with the other GPUs without the need to access other areas of the system beyond the nForce 200.

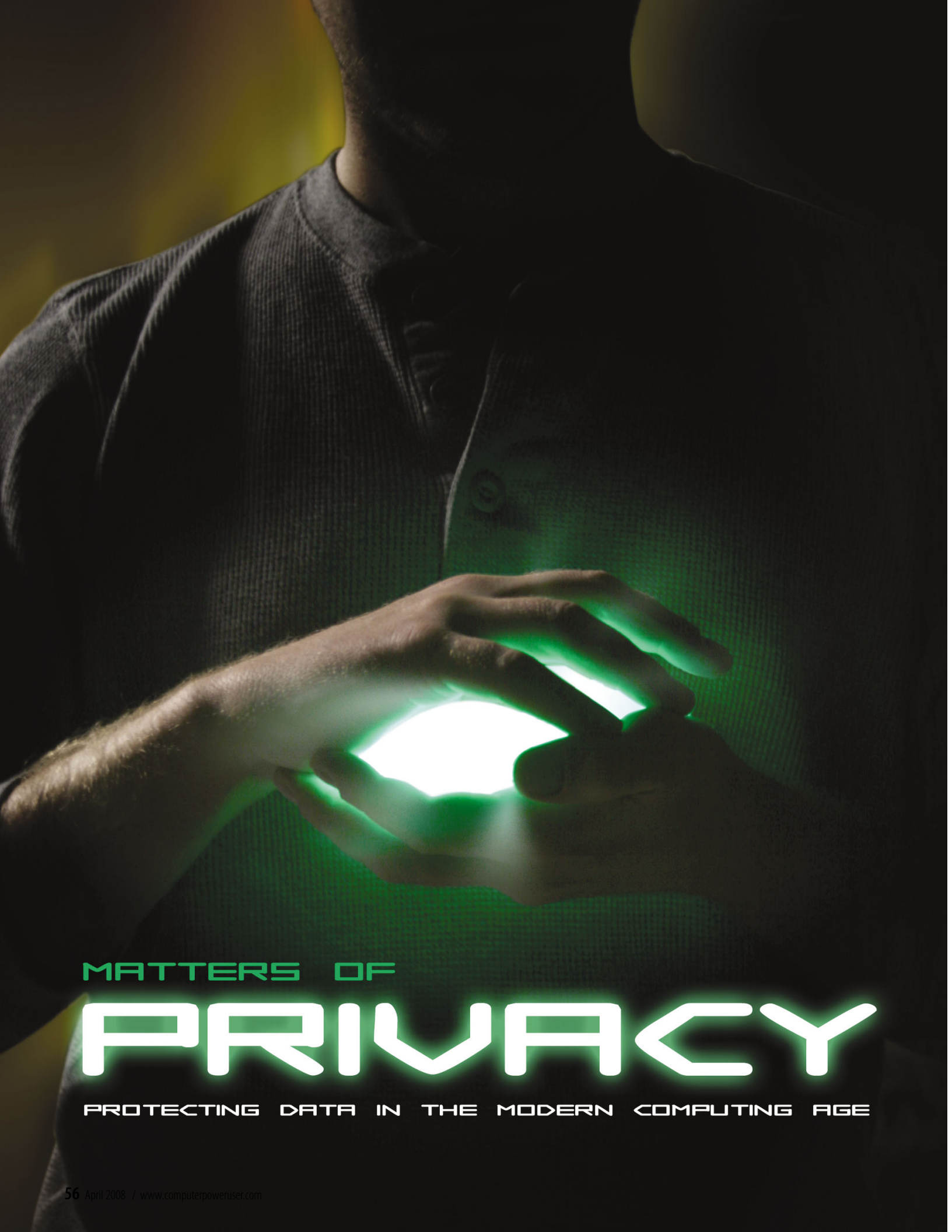
For example, one GPU might issue a command to any one or all of the other GPUs. In other systems, the command would have to travel to the CPU, which would then issue it to the other GPUs. PW



Shortcut allows the nForce 200 to interpret the command and issue it to the other GPUs.

"You don't need to go to system memory on the CPU to transfer data to each GPU," Henry says. ▲

Source: Nvidia



MATTERS OF

PRIVACY

PROTECTING DATA IN THE MODERN COMPUTING AGE

Scott McNealy has uttered his share of memorable quotes through the years. Perhaps no quote has been as revisited, though, as the “You have zero privacy anyway. Get over it” blast he dropped in 1999 upon the launch of Sun’s Jini, a technology described as “a set of specifications that describe how to build adaptive distributed systems that run on the Java platform.” As legend goes, McNealy’s proclamation was in response to questions concerning security provisions planned for Jini and came just hours after Intel backtracked on turning the Pentium III loose with an ID feature set to “On” by default. Security proponents immediately blasted McNealy, but there’s a reason his words still carry weight today: There’s much truth to what he said.

McNealy expounded on the statement years later in an interview with the *San Francisco Chronicle* saying, “The point I was making was someone already has your medical records. Someone has my dental records. Someone has my financial records. Someone knows just about everything about me. Gang, do you want to refute my statement? Visa knows what you bought. You have no privacy. Get over it. That’s what I said.” Brash? Maybe. Off base? Not really. Today, it doesn’t matter if you’re a senior citizen using a public library’s computer or DIYer shopping online for a memory kit; trouble lurks a modem’s throw in any direction.

Hell, McNealy felt insecurity’s wrath himself in 2006 when a laptop containing his Social Security number was stolen from the car of an employee of Ernst & Young, an auditing firm Sun charged with ensuring its compliance with Sarbanes-Oxley (federal legislation that regulates financial reporting and governance of public companies). More recently, an intrusion of TJ Maxx’s system resulted in reportedly 100+ million stolen credit card accounts.

In its 2008 Internet Security Outlook, CA Global Security Advisor states, “2007 was a record year for data loss,” and “Malware shows no sign of ebbing in 2008.” Referencing quotes from Vint Cerf, the report cites between 100 and 150 million of the 600 million computers on the Internet in 2007 were part of botnets. CA also reports spyware bypassed Trojans for the

first time in 2007 as the most prevalent malware type (56% spyware, 32% Trojans, 9% worms, and 2% viruses), while 90% of Internet email is now spam (with 80% toting links to malicious sites or malware).

Platform-wise, experts predict Mac users can expect more attacks similar to those Windows users have battled for years, due to Apple’s increasing market share. “At the end of the day, malware writers don’t care what operating system you are using; it’s about whether or not you have valuable information on your machine and whether there is an opportunity to take advantage of it,” David Marcus, McAfee Avert Labs security research manager, said in an *InfoWorld* interview.

According to CA’s report, NIST’s National Vulnerability Database compiled 6,410 software vulnerabilities in 2007, including 179 for Apple and 245 for Microsoft. Also sobering is CA’s prediction that “gamers will be the lambs of 2008,” as even “technically savvy users are currently being victimized in new ways never considered possible.”

If we’re certain of anything security-wise, it’s that *CPU* readers don’t need a lecture on the importance of shoring up defenses. You know the threats that rogue Web sites, malware, Trojans, rootkits, vulnerabilities, viruses, and suspect EULAs present. Yet, what helped protect you yesterday may not be cutting it today. To that end, we offer the following articles containing methods and products aimed at securing your Web browsing, email, and personal data. We’ve detailed procedures and products for optimizing browser privacy settings, phishing detectors, email and Web proxies, passwords, Web sites, and more. We’ve also tested Web anonymizers, encryption apps, and security-centric hardware, as well as addressed issues pertaining to user accounts and permissions, encryption, detecting/removing spyware and Trojans, and properly destroying hard drive-based data.

McNealy’s characterization of privacy may have been spot-on, but that doesn’t mean we shouldn’t fight the good fight in deciding whom we unwillingly gift our personal information to. ▲

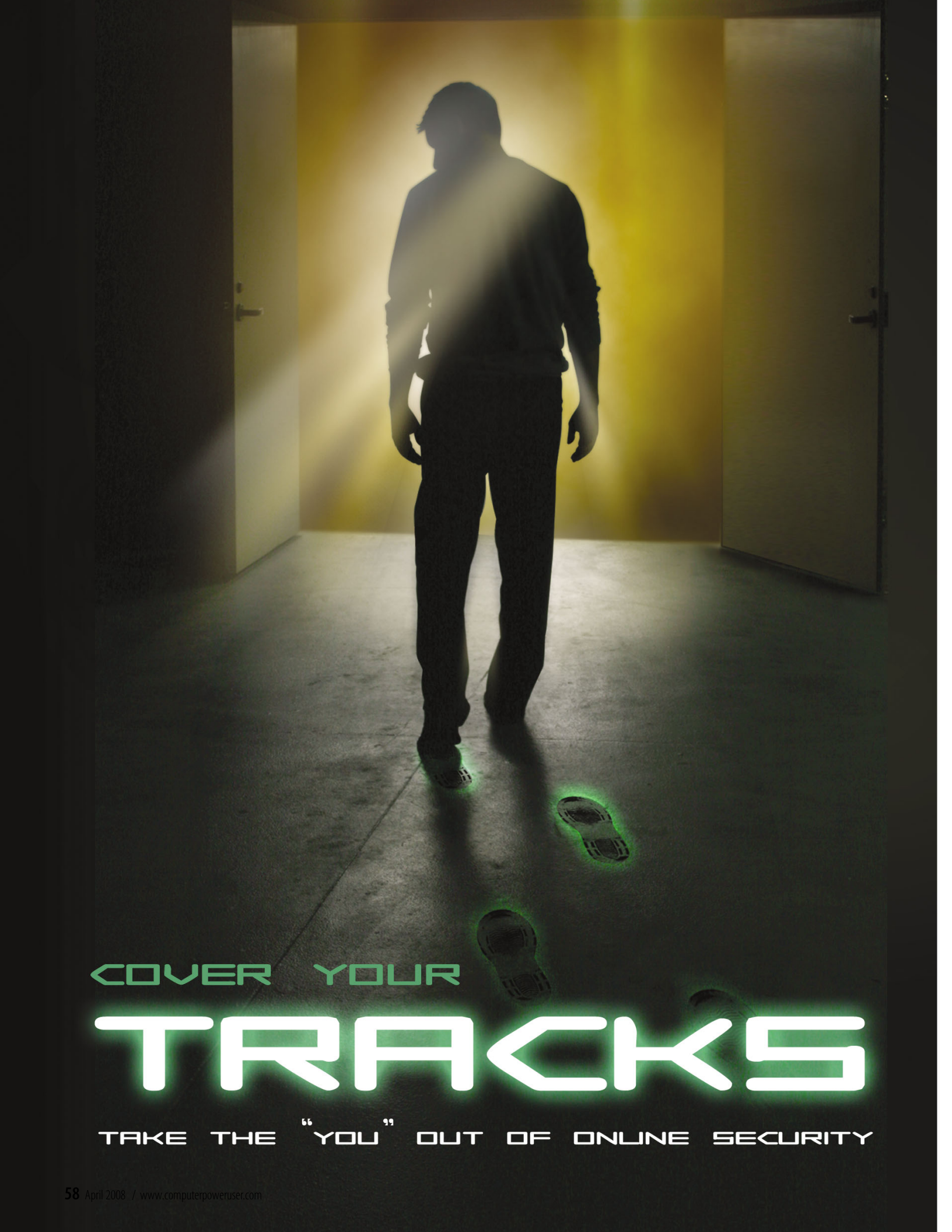
by Blaine Flamig

58

COVER YOUR “TRACKS”
TAKE THE “YOU” OUT OF ONLINE SECURITY

66

KEEP IT SECRET, KEEP IT SAFE
YOUR DATA IS YOUR BUSINESS



COVER YOUR

TRACKS

TAKE THE "YOU" OUT OF ONLINE SECURITY

Security and privacy are a huge part of your life in the physical world, although it's so ingrained you probably don't even notice. You have locks on your home, your car, your storage space, and perhaps even the drawers in your desk to keep people out of your stuff and keep it secure. Your windows have curtains, blinds, or shades to keep out prying eyes and to maintain your privacy. You might have alarms for your home or car, and your office could even have security personnel.

As our online world becomes a bigger and more important part of our lives, it stands to reason that it should enjoy the same standards of security and privacy we often take for granted in the physical world. But by default, the computer hardware and software we use to conduct both our professional and personal lives is frequently blindingly insecure. Yet because the privacy and security in the rest of our lives is so prevalent, we sometimes pay it no mind. This can lead us to develop online habits that are just as insecure.

Perhaps because of this, digital security breaches and online violations of privacy are so common: Our credit card numbers are stolen; our accounts hacked; our Social Security numbers exposed. Failure points can be hard to determine because even small software flaws, combined with careless online activity, can become big problems.

There's no magic pill to cure all of the problems that lead to lapses in privacy and security: There are many pieces to the puzzle. Here, we hope to at least put all the puzzle pieces on the table, help you find the edges, and get you on your way to a solution.

Four Common Failure Points

Before discussing how to solve different problems, it's worth going over the most common ways our privacy and security gets compromised online. Successful breaches normally combine multiple failure points, so just solving one problem is not a total solution. Maintaining your digital privacy and security normally involves dealing with one or more of these four failure points.

Password failure. The humble password is the electronic key for all of our digital locks, but it can be copied without anything as bulky as a locksmith's key duplicator. Finding a list of login names and passwords is the Holy Grail of data thieves, because they have the potential to open up your entire digital life to someone other than you. And because one password can lead to others, finding just one makes the effort of getting it worthwhile.

Access to your hardware and software. Once someone gets into your house, stealing your belongings is fairly simple. Similarly, if someone gains access to your computer, security software, or thumb drive, your information is ripe for the taking. Sometimes thieves want passwords to get into your hardware or software; sometimes thieves want to get into your hardware or software to get your passwords. One can beget the other, and letting either happen is a significant problem. Don't forget that "your hardware" doesn't just refer to computers you own, but any computer you might use, such as public terminals or kiosks or a computer in your office.

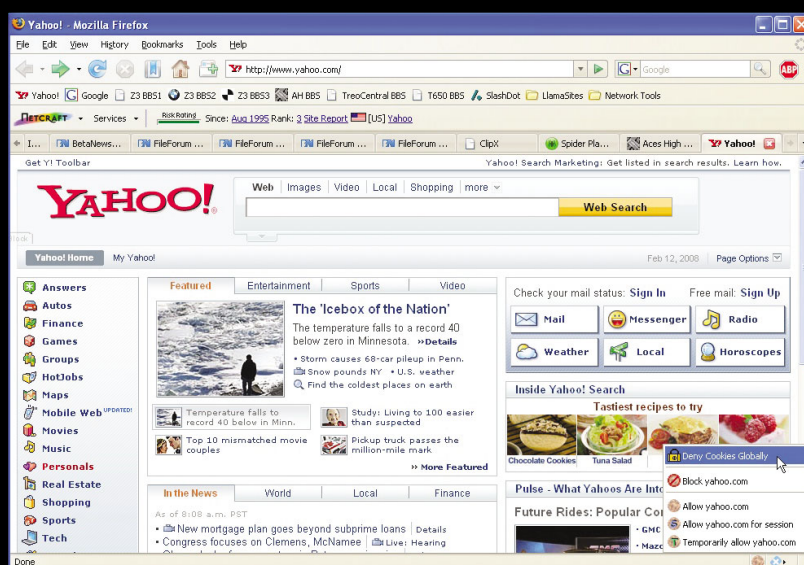
Snooping on data streams. If physical access to your computer and software isn't possible, snooping on the data packets zipping between your computer

and their destinations can be the next best thing. Email passwords, for example, are frequently transmitted "in the open," unencrypted and ready for snooping. Encrypted, secure Web sites do a good job of scrambling personal data as it travels the Internet, but sophisticated snoopers can still determine what Web sites you visit, when you visit them, and, to a certain extent, where you are in the world when you access them.

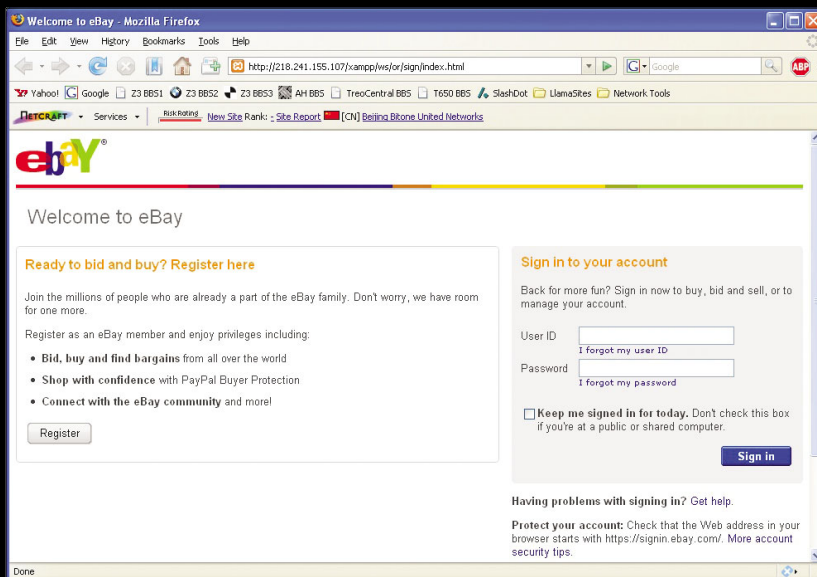
Social engineering (being tricked into giving up secure information). Sometimes the easiest way for someone to get your passwords, credit card numbers, or other personal information is to simply ask, all the while appearing to be someone who you would ordinarily answer. Known more simply in the Information Age as "phishing," social engineering can be as simple as calling someone at their office and saying, "Hi, this is Bob down at IT. We're doing some tests, so can you please tell me your password?" Maintaining vigilance against phishing/social engineering is sometimes easier said than done.

Good Password-ology

Good security starts with good passwords and good password practices. In



CS Lite's menu (which appears in the lower-right corner) gives you several controls for cookies.



Netcraft adds a browser toolbar that posts a clear warning for what it believes are phishing sites, such as this eBay impostor.

other words, you want a password(s) that's both hard to guess or crack, and you want to handle your password(s) such that if one is compromised, whoever has it won't have instant access to your digital life.

Most of the "good password tips" you've heard are true, but they bear repeating. We recommend a strong password have at least seven characters, a mixture of uppercase and lowercase characters, and at least one number or special character (!, %, &, {, etc.). These make random character generation attacks on login screens too lengthy a process to be worthwhile.

Passwords shouldn't have words found in dictionaries, which foil dictionary-based login screen attacks. Don't use a word that friends are likely to guess; if your nickname is "Llama" or your kid's name is "Joshua," then using either of these is a bad idea. Don't use obvious or accessible personal information, such as a birthday, Social Security number, employee number, or driver's license number. A random collection of numbers and letters is, of course, quite secure, but difficult to remember without a system in place to recall it.

A more memorable, yet still fairly random password can be generated by using

an acronym of a personal phrase or expression. For example, "I met my wonderful wife on vacation in Canada" becomes "1mMwWoNv1C" after putting in a few strategic numbers in place of obvious letters.

Most security experts will say that you should use a unique password for every site and account you have, yet you should never write your passwords down where they can be easily found. Unfortunately, this can lead to forgotten passwords and endless frustration, but there are alternatives. There are many "password storage" programs out there: You store all your login names and passwords in an encrypted "vault," which needs just one master password to unlock. Such programs exist for Windows, Mac, and Linux OSes, and even PDAs and smartphones, and some are integrated into your Web browser that enter login info automatically. Two examples are SplashID (splashdata.com) and KeePass (keepass.info).

If you must write them down, keep that paper far away from your computers and consider writing a reminder of the password instead of the password itself. If you insist on reusing passwords, at least use different ones for your email

account (which is normally transmitted unencrypted), unencrypted Web sites (such as discussion forums and social networking sites), and encrypted Web sites (such as financial Web sites, banks, PayPal, and eBay). This will at least keep packet sniffers from getting the really valuable password. And finally, you should change your passwords once or twice a year, just in case your password gets out there despite everything else.

Of course, there's one often-overlooked tip regarding password security: Never give it to anyone who asks for it. Ever. An organization such as your bank or eBay should never require your password for system maintenance or upgrades, because their tools should have the rights to perform any account activities automatically. At worst, a system may require your password to be reset to something new, but any secure system will reset your password, email you with the change, and then request that you change it via an automated system. Another human being shouldn't be involved. It seems this message is getting through to people, if slowly, because hackers are now resorting to simulating legitimate Web sites for the purposes of getting you to type your password. We'll cover these phishing attacks later.

Safe Computing Basics

Having nailed down passwords, the next level of defense against those who would compromise your security and privacy is to use only computers that don't give up key information at the slightest provocation. Although we don't really have this sort of control at kiosks and others' computers (more on this later), there are many things we can do to ensure some level of safety on our own computers.

First, make sure your computer's "Automatic Updates" feature is enabled, regardless of your OS, for several reasons. The first is that this updates the system's default Web browser and email program, be it Internet Explorer, Safari, Konqueror, Nautilus, Outlook Express, Windows Mail, or Apple Mail. It also updates any of the OS' built-in security features, such

as Windows Defender or a built-in firewall, and plugs any known security holes in the base operating system. All of this is important to deny anyone direct access to your computer via known security flaws and browser holes, which are discovered and published all the time.

Other Web browsers, such as Firefox or Opera, or email applications, such as Thunderbird or Eudora, have their own automatic updating procedures; make sure they're enabled so you're using the latest versions of them, as well. Less popular Internet programs, such as your instant messenger, Bittorrent client, FTP program, or IRC client, generally don't have auto-updaters, so it's up to you to make sure you have the latest versions.

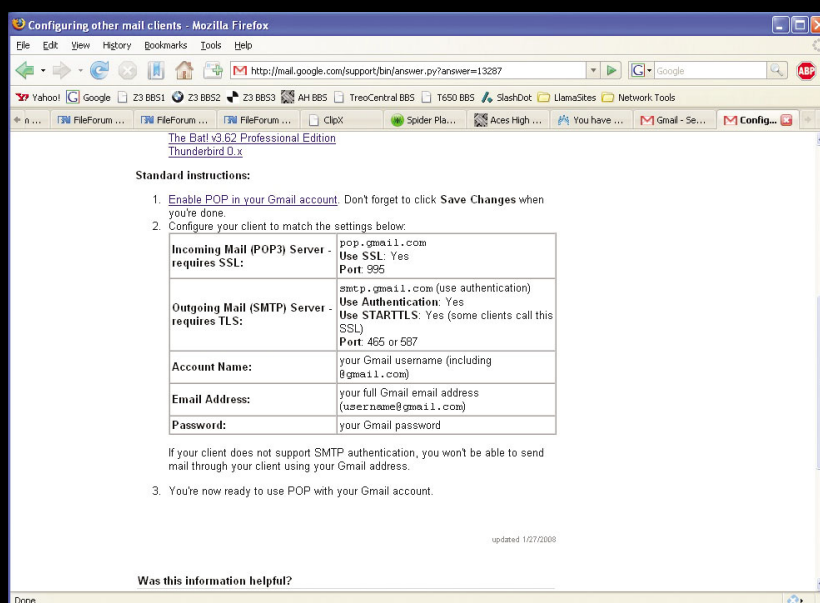
Additionally, don't forget about updates to common browser plug-ins, such as QuickTime, Flash, and Acrobat, and any others that have security updates. Like OS updates, these program may have security holes that new versions close, preventing unauthorized PC access.

Regularly using alternative programs (such as Firefox) instead of mainstream programs (such as Internet Explorer) may help reduce the likelihood of a zero-day threat (an attack on an unpublished or unpatched vulnerability) compromising your security, if only because more threats are aimed at the bigger targets than the smaller ones.

Finally, you don't want a backdoor installed into your system by a virus, rootkit, or spyware, any one of which can potentially slip in despite a fully patched OS, Web browser, and email client. A quality antivirus product, such as Norton AntiVirus or ESET's NOD32, both of which we've tested, do a good job of detecting viruses in files and blocking "drive-by downloads" from infected Web sites. At minimum, you should set your security programs to perform a full scan at least once a week. If they aren't free, then pay for the annual subscription for new malware definitions.

Browser Privacy Options: Cookie Control

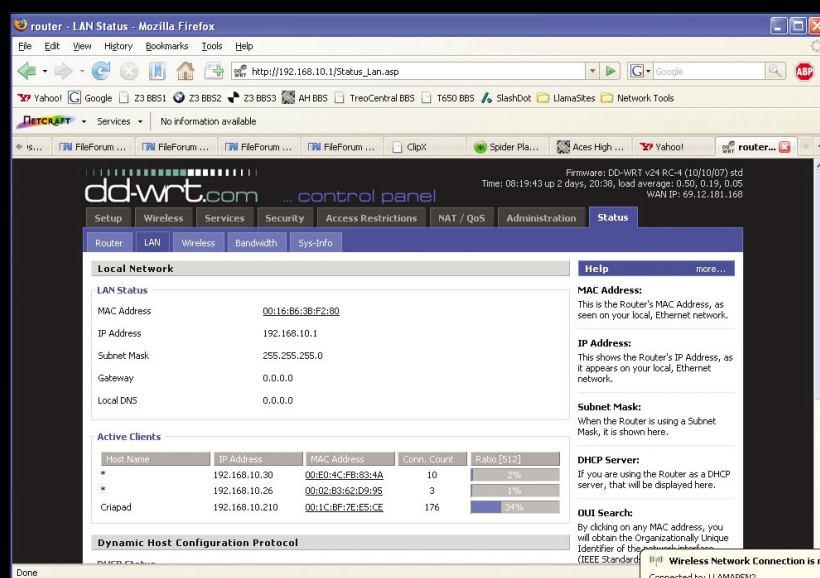
Cookies get a lot of people worked up about privacy and security, so browsers offer users much more control over them



Enabling SSL encryption in your email program makes transmitting your email login/password more secure.

than when they became widely known to most users in the late 1990s. Ironically, cookies aren't really a significant security threat, and only a marginal privacy threat, but they do things in the background without permission by default, so they're worth looking into.

Specifically, the cookie file normally contains nothing more than an identification number (usually a randomly generated, unique string of letters and numbers), a URL that identifies the Web servers that are allowed to interact with it, and an expiration date



DD-WRT is a powerful third-party router firmware that opens the door to many ways to control your online privacy.

indicating when the system should delete it. (If there's no date, the browser deletes it when your session ends.) Cookies are not viruses or spyware (because they aren't executable), don't contain credit card numbers or other sensitive information, and (barring any bugs, which is why you should always update your browser) a Web site can't "read" another Web site's cookies.

The privacy issue comes from so-called "third-party cookies," or cookies that come from the Web servers that host banner ads or graphics on the Web sites you visit. Advertising companies, such as DoubleClick (www.doubleclick.com), use their cookies to mark you with a unique identifying number. They can then track your identifying number Web sites with their banner ads. Over time, DoubleClick builds a profile of all the sites you've visited and then starts tailoring banner ads to match your interests. Visit a lot of online electronics stores? DoubleClick will start displaying banner ads for electronics stores wherever you visit that uses DoubleClick advertising.

Many online shopping carts simply won't work if you turn off all cookies (which all browsers let you do, by the way), so your best bet is to disable third-party cookies. In Internet Explorer 6 and 7, choose Internet Options from the Tools menu. Then click the Privacy tab and the Advanced button. Put a check mark next to Override Automatic Cookie Handling and set Third-Party Cookies to

Block. If you're just curious how many third-party cookies you're exposed to, choose Prompt instead.

Firefox 2 removed this option for some reason, but extensions such as CS Lite (addons.mozilla.org/en-US/firefox/addon/5207) bring it back. To enable it, install CS Lite and restart Firefox. Choose Add-ons from the Tools Menu. Then, select CS Lite and click the Options button. Click the Global tab and then select Allow For Originating Web Sites Only from the Global Cookie Behavior drop-down menu. CS Lite can also automatically download a blacklist of source IP addresses for cookies, preventing them from working, rather like an Adblock subscription list.

Phishing Detection & Prevention

Although cookies aren't usually a significant threat to privacy and security, phishing most definitely is. Education is normally all that's required to avoid phishing scams, but software has caught up, too. The easiest way to avoid phishing scams is to know that financial institutions have backup systems in place, so there should never be a need for you to re-enter your personal information. After all, what are the odds that Citibank lost your credit card number but kept your email address? Secondly, if you believe the message might have a kernel of truth, simply don't click any hypertext link from the email; instead, just open a browser window yourself, navigate to the legitimate site of institution that purportedly emailed you (in our example, Citibank), and log on.

New technology can help. Antiphishing filters now exist, and they work by comparing the IP address of a Web site in your browser with a constantly updated list of known phishing and compromised Web servers. Internet Explorer 7 and Firefox 2 both offer antiphishing filters that are enabled by default,

powered by MSN and Google, respectively. In our testing, we found them to be fairly effective, catching about 70% of phishing scams before allowing users to enter information.

Netcraft (toolbar.netcraft.com), a free antiphishing toolbar, is an alternative that we found to be even more effective, and it's compatible with both IE and Firefox. Symantec's Norton Internet Security 2008 (\$59.99; www.symantec.com) has an antiphishing toolbar that utilizes blacklists and heuristics to root out phishing schemes you might encounter before the blacklists can catch up.

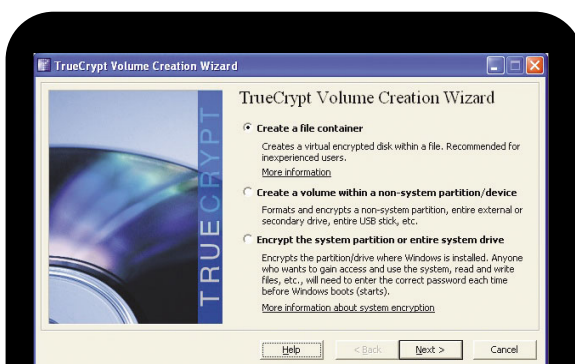
Public Precautions

There are times when using a public Internet terminal is the only way to get online. But when you do so, your privacy and security are probably at greater risk than if you were computing at home or even using your notebook at a public Wi-Fi hotspot. It may not be possible to completely mitigate these problems, but you can always make the attempt.

When using a hotspot with your own notebook, the most important thing to keep in mind is that it would be very easy for an unscrupulous operator, or in some cases, another patron with a wireless notebook, as well, to be running a packet sniffer. Packet sniffers can easily decode unencrypted packets traveling through the hotspot, be they Web pages, email, or login names and passwords.

Encrypted data is a different matter, however. Any secure Web sites you visit, which are those that begin with "https://" rather than "http://", are encrypted, meaning that any login/password information sent, and any content you view, can't be viewed with packet sniffers. Seek these sites out.

Email is a special case. By default, email logins and passwords are sent unencrypted, making them vulnerable to packet sniffing, which is a good reason for your email password to be different than any of your others. But there are also ways to transmit your email login/password more securely. Outlook,



TrueCrypt keeps your data under digital lock and key. (See page 69 for more information.)

Hardware That Locks It Down

There are many hardware bits and baubles that can improve or ease security and privacy, and we've taken a look at a handful:

Corsair Flash Padlock

Though we looked at this device last year (see page 38 in the November 2007 issue of *CPU*), its unique position in the market requires another look. The Flash Padlock is essentially a high-speed USB flash drive with a combination lock: Five buttons representing 10 digits run along the side of the drive, rendering it totally inert until the correct combination is entered. A small, replaceable battery powers the keypad and its associated red and green LEDs, so if it should die (it has a three-year lifespan), you aren't left high and dry, unable to get your data.

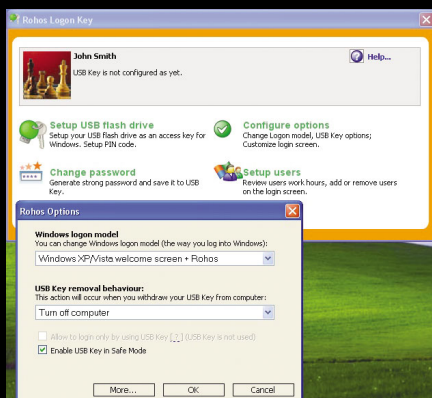
An instruction sheet lets you set a PIN between one and 10 digits long, as the unit is unlocked initially. Once set, entering the PIN gives you a 15-second window to insert the drive into a computer, be it a Windows, Linux, or Mac OS computer, though a certain combination of buttons can leave it unlocked for longer. It locks automatically within 15 seconds of removing it from a USB port, but there's no way to lock it while still inserted.

Unlocked, the device doesn't even register to a computer when inserted, so cracking it with a computer is unlikely. The PIN is itself encrypted, so that's not easily cracked, either. Physically bypassing the digital lock, however, is possible: The drive's plastic body separates with a screwdriver, and, theoretically, a few minutes with multi-meter, wire, soldering iron, and a working unit to test the connections is all it takes to bypass the lock on the locked unit. It's unlikely a passerby who recovers your lost drive will ever do this, of course, but someone could if they really had to have your data.

So although it's not enterprise-grade security, the Corsair Flash Padlock is good for the average user who needs to protect his data and doesn't have determined savvy enemies.

Rohos Logon Key

Logon keys act sort of like a key for a car: You can't start or run a properly configured computer without one inserted into the right slot, which for a PC is a USB port. For some users, this model of security is familiar and comfortable, but there



Flash Padlock

\$35.99

Corsair

www.corsair.com



Logon Key

\$25.00

Rohos

www.rohos.com/welcome-screen/



can be a drawback. Lose the key and say goodbye to your data, because most PC keys work with their software to encrypt your data, and the decryption key is hard-coded into the USB PC key. The Rohos Logon Key offers what might be a happy medium—a login that requires the insertion of the USB Key, but no data encryption in case you lose it.

Logon Key works with any standard USB thumb drive, and it's small, consuming under 100KB, so you don't have to sacrifice your thumb drive's storage. Once installed via Windows Installer, you can set your computer to only let users log on if they have the right USB key inserted. (You can still allow users to enter a password without the key, if you wish.) When the key is removed while the system is running, it should run normally without requiring the key. You can set one key to unlock many computers or let one computer be unlocked by many keys, and since the key is literally a flash drive, making copies is cheap and simple.

The system still works even when Windows boots into Safe Mode, and the data on a system with the software is still readable using a Linux LiveCD, a BartsPE Disc, or even removing the drive and looking at it with another PC. That's probably secure enough for most users while still providing a safety net, should the key be lost.

APC Touch Biometric Password Manager

Dubbed the Biopod from APC, this inexpensive, mouse-sized fingerprint reader does a good job of keeping track of all your passwords, including your Windows login password, and automatically entering them as soon as you touch your finger to the fingerprint reader. It also knows to press the virtual ENTER key, so logging in is truly a "hands-off (the keyboard)" experience.

Setup is fairly straightforward: Plug the Biopod into a USB port, follow the New Hardware Wizard, and run the setup software on the included CD. After a reboot, a wizard appears to read your selected finger multiple times and then asks for your Windows password. From then on, it monitors Internet Explorer (sorry, Firefox users) and Outlook Express for password prompts, letting you to save your login info within the APC software. The next time you visit the site, a fingerprint prompt appears; when you touch the Biopod with the appropriate finger, you're in.

The Biopod can keep track of 10 fingers, be they from different people or all yours, allowing for fast Windows user switching literally at your fingertips. We wish it worked with more applications, but it does work quickly and easily with its limited range of software. ▲



Touch Biometric Pod Password Manager

\$49.95

APC

www.apcc.com



Outlook Express, and Thunderbird all support SSL-based encrypted logins, but most email providers don't enable it by default (with Gmail being one notable exception to this rule).

One simple security boost you can give your email is to contact your email provider and see if it has an encrypted POP/IMAP/SMTP login option. If it does, enter those settings into your email program. Another option is to use your email provider's Webmail page instead and then use any encrypted versions it might offer.

Kiosks and Internet café computer users should take all of the above precautions, for packet sniffers can be used just as easily on them as a notebook's Wi-Fi signal, but the key difference is that someone else has full control of the computer you used once you're done with it, so "cleaning up after yourself" is an important consideration.

If you have access to the kiosk's USB ports or CD/DVD-ROM drive, then you have quite a few options. You can run several protected browsing environments, most of them based on Firefox, directly

from a USB thumb drive. Plus, you could run a password manager that stores passwords and automatically enters them when required, foiling any secret keyloggers a kiosk owner might have installed or become infected with.

If you can insert a custom-burned CD-R (that you happen to be carrying with you, which may not be likely) into the Kiosk and boot to it, then a Linux LiveCD should let you surf the Web, check email, and do all sorts of Internet-related tasks. It won't even touch the system's hard drive, so it can't (and you won't) leave a trail. The latest

Slick Software For Safe(r) Surfing

There is a whole industry geared toward improving your online security and privacy via software utilities. We've looked at many in the past, and new offerings are always popping up.

Passwords: RoboForm Pro

Good computer security starts with good passwords and password management, and RoboForm Pro (www.roboform.com) is just about the best at both. Available as a standalone application, a portable thumb drive version, and a PDA/smartphone version for Palm, Windows Mobile, and Symbian (which syncs with the main versions automatically), RoboForm Pro saves all your passwords under one master password. And it saves your passwords with 128-bit encryption. After you give it some basic information about yourself, such as your name, address, phone number, and even credit card and Social Security information, it can enter it automatically into Web page forms. You can choose how much information you want to provide, but the more you provide up front is less you'll have to enter manually each time you need to fill in a form. Obviously, it also remembers your logins and passwords and enters them automatically, too.

RoboForm's advantages are plentiful. You'll never have to write down a password where it might be found, and if you lose your computer or thumb drive, the passwords are encrypted and safe. Automatic form filling prevents keyloggers from capturing personal information, and it can even generate truly safe (and breathtakingly complex) passwords on the fly, storing them for later automatic use.

We found RoboForm to work well with IE and Firefox, with virtually no system or browsing slowdown, and PDA syncing works as advertised. Buying all the modules together can get a little pricey, however. The base package costs \$29.95, and the USB add-on, RoboForm2Go, is an additional \$19.95. (The standalone version of RoboForm2Go is \$39.95.) The PDA version is another \$9.95.

Encrypted Connections: Linksys WRT54GL Router + DD-WRT Firmware + PuTTY

We covered this just a few issues ago (see "Connect & Conquer" on page 62 in the February 2008 issue of *CPU*), but if your goal is to encrypt your data connection wherever you go, even to "regular" unencrypted sites while surfing from public Wi-Fi hotspots or your office LAN, then a good solution is to use your home's broadband connection. We'll go over the basics again.

Start with a router, such as the Linksys WRT54GL, that can run the open-source router firmware DD-WRT (www.dd-wrt.com). Follow the DD-WRT online documentation to swap out the factory firmware with the new one. (Hint: You'll upgrade to the "mini" version first and then the full "generic" version.) Configure it to share your home broadband connection, and if your home broadband connection uses a dynamic IP address, sign up for a free DynDNS account (www.dyndns.com). Enter your DynDNS account information into the DDNS section of the firmware. This maps your dynamic IP address to something like cpumag.dyndns.com, for example, so you can access it from the Internet. Enable the firmware's SSHd shell and make sure Password Login is Enabled and the Port is 22.

On your PC, install PuTTY (Free; www.chiark.greenend.org.uk/~sgtatham/putty) and configure it to create a local SOCKS proxy on port 3000, connecting to your router via the DynDNS domain name, and log in with your router's login name (normally "root") and password. Finally, tell your Web browser, email program, or pretty much any program that can use a SOCKS proxy to use the proxy at 127.0.0.1 (which is the localhost IP address) and port 3000.

A convoluted process? Yes, but it's one of the few sure-fire ways to keep packet sniffers from figuring out what you're reading online, no matter where you go.

Masking Your Internet Location & Destination: Tor

As a matter of course, all Web servers know the IP address of every one of its visitors; it's the nature of TCP/IP networking. Similarly, all ISPs,

Ubuntu (www.ubuntu.com) LiveCD is excellent at recognizing a wide variety of hardware and is relatively easy to use. Another option is to use your Windows CD and build a Bart's PE disc (www.nu2.nu/pebuilder) with the Firefox add-on installed. This disc behaves like a Linux LiveCD, with a working browser and network stack, but it runs a type of Windows XP. The Bart's Web site has links to excellent, detailed instructions on setting up a Bart's PE disc.

Many kiosks and café computers don't give you this sort of hardware

access, so you'll have to make do with several practices that should thwart basic attempts to track your activities. First, avoid logging on to any financial Web site or making purchases that require a credit card number, just in case a keylogger is installed on the system. Keyloggers will get your personal data regardless of whether you're connecting to an encrypted Web site.

Next, when logging in to a site, uncheck any option such as "Remember My Password" or "Remember Me," since it probably won't be you who's using the

computer tomorrow. Similarly, if the Web browser offers to remember a login or password, choose "No" or the equivalent, and make sure you completely log out of anything you've logged in to, for the same reason.

Finally, when finished, tell your browser to forget as much about you as possible: In Internet Explorer 7, choose Delete Browsing History from the Tools menu. In Firefox, select Clear Private Data from the Tools menu. ▲

by Warren Ernst

be it a cable or telephone company, Wi-Fi hotspot, or even the administrators of your office's LAN, can determine what IP addresses your Internet packets are intended for, thereby determining what Web sites you're visiting. In other words, conventional Internet communication is subject to what is called traffic analysis. And with enough analyzing, motivated administrators can get a fairly detailed profile of your activities.

Tor (www.torproject.org), short for "The Onion Router," is a network of anonymous routers on the Internet, each of which is designed either to accept packets from users running Tor on their computers, randomly forward packets to other Tor routers, or take a packet from another Tor router and pass it along to the packet's destination. This confounds traffic analysis in three ways. First, ISPs only see your packets going to a random Tor router instead of its final destination. Next, Web sites only see packets coming from random routers on a Tor network, instead of your IP address. Finally, packet pathways through the Tor network are constantly changing on a random basis.

Tor is compatible with any Internet application that works with SOCKS proxies, though the Tor network filters SMTP (outgoing mail) packets to confound spammers. Tor can (and does) tend to slow down your Internet connection because your packets are getting bounced all over the world en route to their final destination.

Several portable versions of Tor are also available, usually coupled with Firefox and a Tor plug-in, which makes enabling and disabling it a snap. PortableTor (portabletor.sourceforge.net) is the base version that's ready to be modified, while the free XeroBank browser (xerobank.com/xB_browser.html) integrates Tor and Firefox directly. Both work directly from USB storage devices such as thumb drives or iPods.

Encrypting Or Eliminating Your Data Footprint

When you use any sort of software on a computer, it tends to leave footprints that indicate where you've been. Cookies and browser histories are obvious footprints, but there are also subtle ones, such as

temporary Internet files and cache files, not to mention your email mailbox files or bookmark files. There are generally two approaches to solving this problem: Encrypt all that you can so that any found files look like gibberish or move them off to portable storage and take them with you, leaving nothing to be found in the first place.

On the encryption side, it's hard not to like TrueCrypt (Free; www.truecrypt.org), an open-source encryption utility that creates virtual encrypted partitions created either with AES-256, Serpent, or Twofish algorithms. Once unlocked with a password, the encrypted spaces look like normal hard drives, where you can store files or install programs. You can also create a hidden second encrypted partition within the first one, but it is utterly undetectable. TrueCrypt is already out for Windows and Linux. A Mac version should be out by the time you read this.

The e-Capsule Private Browser HD (\$19.95; www.eisst.com) and e-Capsule Private Mail (\$29.95) programs combine nearly all the elements mentioned thus far. Both products combine versions of Firefox (or Thunderbird), Tor, and a TrueCrypt-like encryption system, installing a self-contained and self-encrypting program that leaves no unencrypted tracks on a host system. There are also portable versions that work on U3 thumb drives, letting you take the encrypted files with you.

Programs such as MojoPac (www.mojopac.com), which we cover elsewhere in this issue (see page 79), and Moka5 (www.moka5.com) take this even a step further, creating virtual machines that run either alongside (MojoPac) or inside (Moka5) Windows. MojoPac manipulates Windows into installing files to a thumb drive or a reserved folder, while Moka5 installs a temporary Windows infrastructure so VMware Virtual Appliances can run directly from a thumb drive. Although Moka5 offers virtual appliances, the most interesting one is the Fearless Browser (www.moka5.com/node/1325), which combines a Linux distribution with Firefox, GAIM, and Thunderbird, along with Tor and all its related plug-ins, all running within a window inside Windows. Both apps take a few minutes to install and set up on a thumb drive, work surprisingly quickly, and have plenty of space on a 1GB or 2GB storage device. ▲

KEEP IT
SECRET

KEEP IT
SAFE

YOUR DATA IS YOUR BUSINESS



Everything has a dark side, and being a power user is no exception. We do so much with our PCs that our lives tend to become fully invested in them. Credit card numbers, private correspondence, résumés, passwords, you name it—it's sitting in our computers waiting to be exploited. And there are all kinds of programs and people ready, willing, and able to take it from us.

In the distant past, we mainly worried about hackers trying to impress one another with clever viruses designed to destroy data or infect the maximum number of possible machines. Now it's personal. ID thieves are targeting us, keyloggers are snagging our personal information, and data is being stolen, not erased.

"Privacy and data theft protection tools are on their way there," says Aston Fallen, CEO of privacy software company Steganos (www.steganos.com). "The consumer is realizing how important it is not only to protect the perimeter of the machine from infiltration from viruses and spyware and so forth, but to protect the data on the machine from malicious misuse."

Whether you're afraid of something as basic as drive-by spying while browsing the Web or something as horrific as being the target of an all-out personal vendetta, you have every reason to protect your data and your privacy. The tools covered in this article make it easy to do both.

Lock Down The OS

The security features built into your operating system are obviously the first line of defense when it comes to safeguarding your data. Getting rid of extraneous user accounts and password-protecting those that remain is an obvious first step, but you also need to lock down file sharing permissions and rely on a bundle of software to keep your data out of the wrong hands.

If you have a home network, only share what is necessary instead of flagging entire drives for sharing. To do this in Vista, click Start, click Computer, and right-click the hard drive. Select the Sharing tab, click Advanced Sharing, and remove the check from the Share This Folder box before clicking Apply to disable sharing for the drive. Click the Network And Sharing Center link in that tab to adjust the Sharing And Discovery options. The links at the bottom let

you see which files and folders are currently being shared, and the options in the Sharing And Discovery section let you fine-tune your settings.

In Windows XP Pro, turn off Simple File Sharing by double-clicking My Computer, expanding the Tools pull-down menu, and clicking Folder Options. Click the View tab and clear the check mark from Use Simple File Sharing before clicking Apply. If you want to turn off sharing for an entire drive, double-click My Computer, right-click the icon for the drive, and click Properties. Click the Sharing tab and clear the Share This Folder On The Network radio button before clicking Apply.

Antivirus, Antispyware & Antirootkits

It takes more than any old antivirus and antispyware package to stave off threats to your data. The best solution would prevent future threats from infiltrating your computer in addition to annihilating the existing threats that are already present, but it still takes a combination of software to accomplish this.

You can use any combination of anti-spyware software you wish (or at least are willing to commit resources to), but antivirus software plays by "Highlander" rules: There can be only one. The methods antivirus products use to scan a hard drive tend to make antivirus packages detecting threats think that World War

III is breaking out, and the ensuing conflict can do anything from slowing Windows to a crawl to rendering the OS inoperable.

Because you should only use one antivirus product, make sure it supports some key features. The inclusion of a good heuristic scanner is essential because it can detect new threats for which signature files are not yet available. Email protection (including virus scanning, antiphishing, and spam filtering) is also crucial, because so many threats can enter your PC this way.

A final ability you'll want is rootkit detection. Rootkits are the nastiest of the nasty because they let malware get

Security Software Roundup

We tested dozens of security-related packages to come up with this cross-section of products that do a good job of helping you protect your precious data.

Security/Privacy Suites

Steganos Privacy Suite 2008

As the name suggests, this suite focuses on privacy instead of threat management, and it's loaded with features. You can create as many virtual drives (up to 512GB per drive) as you wish, then lock them down with real-time, 256-bit AES encryption. Another tool puts all of your email contacts, calendar data, and other information on the secure drive. You can configure any of these secure drives to open as soon as Windows boots (provided you supply the proper passphrase), making them easy to work with throughout the day. The utility then resecures your files when the computer shuts down. A File Manager utility also lets you encrypt individual files or entire folders and can even hide them.

The included shredder is terrific, offering manual or scheduled secure deletion of both free space and any files or folders you choose. It can use a variety of algorithms, including Gutmann. A password manager makes it easy to use secure multiple passwords without worrying about forgetting them. Overall, this collection makes an excellent companion for your antispyware and anti-virus tools.

Privacy Suite 2008

\$79.95

Steganos

www.steganos.com



off threats, including antivirus, antispyware, antirootkit, and antiphishing tools; a firewall; and even a backup utility. The antivirus protection is excellent, and the suite also comes with a hard drive cleanup tool.

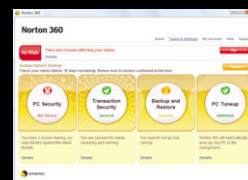
The bad part is that enabling all those features results in a noticeable performance hit in terms of boot times and overall system speed. This is still one of the better suites for total protection, but experts may want to opt for Symantec's standalone antivirus app and assemble the rest of their protection programs separately.

Norton 360

\$79.99

Symantec

www.symantec.com



McAfee Total Protection

McAfee's all-in-one suite comes with its terrific antivirus software along with a firewall and antispam, antispyware, antirootkit, and antiphishing tools, among other features. But like Norton 360, using all of the software's features on the test PC resulted in longer boot times and slightly more sluggish performance than picking and choosing between the best standalone apps. Also, the installer forced us to remove Spybot Search & Destroy, which we've used for years. This is still a good tool, especially Total Protection's AV software, if you can put up with the potential performance hit (which may have been confined to only our two test PCs).

McAfee Total Protection

\$59.99

McAfee

www.mcafee.com



Symantec Norton 360

This is a true all-in-one security suite, which is both good and bad. The good part is that it comes with nearly everything you need to fend

ZoneAlarm Internet Security Suite

ZoneAlarm rose to fame as a great software firewall, and now that firewall is the centerpiece of an entire security suite. There are antispyware,

into places that are virtually undetectable using traditional antivirus and antispyware techniques. Thankfully, different antirootkit software doesn't conflict with each other, so even if your antivirus software comes with a rootkit detector, use one or more standalone apps to help find these elusive programs and evict them from your hard drive. But never run multiple rootkit programs at the same time or they may interfere with one another, causing false positives or system instability. Scan with one, check the results, reboot the computer to make sure the drive is completely unloaded, and then use a different rootkit scanner.

Be aware that getting rid of rootkits is among the toughest challenges you'll face because there are so many false positives to sift through. A lot of legitimate programs, especially security-related programs, show up in rootkit detection scans and deleting nonthreatening rootkits can cause system instability or prevent Windows from functioning. Rootkit detectors are critical for security, but research everything they uncover extensively before removing anything.

Firewalls

Most people think of firewalls as virtual bouncers who keep the riff-raff from entering your hard drive, but the best

ones work in the other direction, too, preventing snitches from escaping. The firewall included in Vista is an improvement over the firewall that comes with WinXP, but both are inferior to third-party firewalls that have extra features. Make sure any firewall you consider is two-way, watching incoming and outgoing traffic, and also that it uses stateful inspection, which checks the entire contents of packets crossing the firewall and keeps network ports closed until a connection is specifically requested.

Maximizing performance requires the use of a hardware firewall, but these are too bulky to carry for laptop users. Thankfully, there are solutions such as Yoggie's Firestick

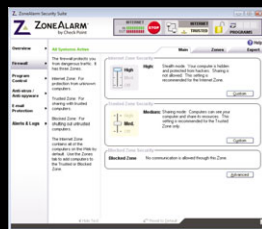
antispam, and antiphishing apps, plus an antirootkit filter that is now baked into the firewall. This is one of the best software firewalls available, and getting more protection for not much more money is a pretty good additional benefit.

Internet Security Suite

\$39.95

ZoneAlarm

www.zonealarm.com



Standalone Antivirus Software

AVG Anti-Virus Free Edition

Although detection rates for this freebie aren't as good as those of commercial rivals, AVG's antivirus scanner has a lot going for it. It stays out of the way (we've never had noticeable performance problems while using it) and updates itself. (Plus, updates are frequent.) You really can't ask for much more for the price.

Anti-Virus Free Edition

Free

AVG

free.grisoft.com



Alwil avast! 4 Home Edition

This is a very basic antivirus tool that has a decent interface once you learn how to navigate it. Like AVG's AV software, Avast keeps itself updated. It doesn't offer the same level of protection as one of our commercial picks, but it's outstanding if you don't want to spend any money.

avast! 4 Home Edition

Free

Alwil

www.avast.com



BitDefender Antivirus 2008

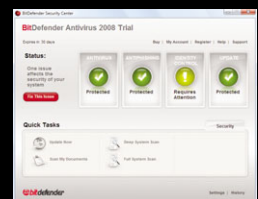
It may not come with a firewall, but if you want a lean, mean anti-virus (and antispyware, antirootkit, and antiphishing) machine, this one's tough to beat. Detection abilities are fantastic; there's a gamer mode that frees up system resources when necessary; and the yearly subscription price is very reasonable for a product of this caliber.

BitDefender Antivirus 2008

\$24.95

BitDefender

www.bitdefender.com



Kaspersky Anti-Virus

Sure, you can get Kaspersky's new Internet Security suite, but the company's best product is still its superb standalone Anti-Virus 7.0. The detection rate, scanning speed, and usability are all great, and this package rolls antispyware and antirootkit tools into the mix.

Kaspersky Anti-Virus

\$59.95

Kaspersky Lab

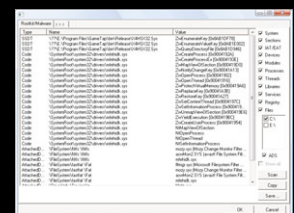
www.kaspersky.com



Standalone Antirootkits Software

GMER

You have to love software with a tagline like "all your rootkits are belong to us," especially when it's free. GMER's biggest asset—its ability to find everything that behaves like a rootkit—is also its biggest failing. The list of potential rootkits we had to sort through after scanning was daunting, probably because we had so many security apps installed on our test machine for this article. This software is definitely aimed at experts and lets you



Pico (\$119; www.yoggie.com), which packs a hardware firewall (with its own integrated CPU and RAM) into a device the size of a USB memory stick. Yoggie's Gatekeeper Pico (\$149) takes it a step further, incorporating a faster CPU and more memory to support a complete on-device security suite. You get the hardware firewall, Kaspersky Anti-Virus, SurfControl content filtering, and MailShell antispam and antispyware, all in a laptop-friendly form factor.

Encrypt It

Face it, if someone really wants to get at your data, he'll find a way. There are simply too many methods to thwart and too many security holes to plug for any of

us to protect the files that are on our PC completely. Encryption lets us concede that fact by making the data they do nab absolutely worthless.

Well, not absolutely. Thieves can still crack the encryption, especially if you make it easy for them. So, *your* job is to use an app that makes *their* job virtually impossible. The best products use algorithms with 256-bit or larger keys, although good apps that only support 128-bit algorithms shouldn't be overlooked.

Basic encryption packages use passphrases to generate keys, but these are vulnerable to keyloggers that record every character pressed on the keyboard. For maximum security, look for encryption

software that uses keyfiles. These are files that are checked in addition to the passphrase, so if the associated keyfile doesn't accompany the encrypted file(s), the file(s) won't decrypt even if the proper passphrase is provided. That means even if a keylogger captures your passphrase and someone copies your encrypted file to open it elsewhere, it won't open because the appropriate keyfile won't be present on her computer.

Keyfiles aren't anything special—you can pick any file on your PC to act as one, so data thieves can't guess which file on the PC is the keyfile. Some software even lets you associate multiple keyfiles with a package, further securing your data. Put

monitor active processes, modules, and services, in addition to accessing the Registry or scanning for malware.

GMER

Free

GMER

www.gmer.net



IceSword

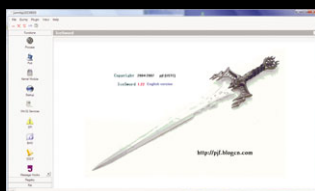
Now that it's been updated to work in Vista, IceSword is better than ever. And it's been one of the best since it was first released. The sheer number of options is frightening and can get you in a lot of trouble if you don't know what you're doing. Learning the ins and outs is well worth the effort, because IceSword gives you a God's-eye view of your system. You name it: If it's a hiding place for rootkits, IceSword will expose it to the light of day.

IceSword

Free

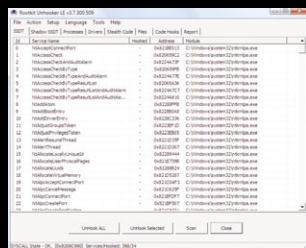
pjf.blogcn.com/index.shtml

(Chinese)



Rootkit Unhooker

If GMER, IceSword, and Rootkit Unhooker can't find it, it probably doesn't exist. Like our other top picks in this category, Rootkit Unhooker, although no longer maintained, is both free and still extremely powerful. The interface is Spartan and divides the different regions that are scanned into convenient tabs, letting users selectively rid the computer of anything the utility detects. This is a wonderful tool, especially when used in conjunction with our other picks. (Just don't use any of them simultaneously.)



Rootkit Unhooker

Free

www.antirootkit.com/software

RootKit-Unhooker.htm



Encryption Apps

TrueCrypt Foundation TrueCrypt

TrueCrypt is so good that using it almost feels criminal, considering it's free. You can use it with a portion of a drive, encrypt an entire drive, or even install it on external media, such as a USB flash drive. You must supply the right password to mount the virtual encrypted disk, which then acts like a regular hard drive. You can drag and drop files to and from it, and TrueCrypt encrypts and decrypts everything in real time. Unmount the disk, and it just looks like a regular old file. In fact, you can give the TrueCrypt containers any file extension you like, making them more difficult for thieves to detect.

When files are accessed directly from a TrueCrypt container, they are decrypted to the system's RAM and not to the hard drive, so no telltale traces of what you accessed are left behind. This even works for video files, which are decrypted in RAM as they are streamed from the TrueCrypt container to your playback software.

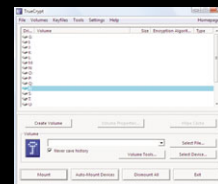
The software uses 256-bit AES, Serpent, and Twofish encryption algorithms, and super-paranoid users can combine two or even all three of them. The software is easy to configure, easy to use, and incredibly reliable, so be sure to take it for a spin.

TrueCrypt

Free

TrueCrypt Foundation

www.truecrypt.org



Axon Data AxCrypt

This program adds an AxCrypt entry, which expands to offer several options, to the right-click context menu. You can simply encrypt a file, giving it an .AXX extension, encrypt and copy the file, or encrypt it and

the keyfile(s) on a USB memory stick, and nobody will be able to get to your files as long as you don't keep it around the PC.

Hide It

Thieves can't steal what they can't see. If you have data that you don't necessarily want to encrypt but still want to keep from prying eyes, you have several options. The simplest, but least secure by far, is to simply flag a file or folder as hidden. Right-click the file, click Properties, and check the Hidden box. Next, set your OS so it doesn't show hidden files. If you use Vista, open any folder, expand the Organize menu, and click Folder And Search Options. In WinXP,

open any folder, expand the Tools menu, and click Folder Options. Now select the View tab, click the Do Not Show Hidden Files And Folders radio button, and click Apply To Folders (or Apply To All Folders in XP).

Of course, anyone with access to your administrator account can show any hidden file and access it, so you're much better off with a utility that hides files and folders more securely. Obviously you want this software to be password-protected so that nobody can disable the hidden setting (or even see which folders you're hiding). Some utilities also give you the option of keeping a folder visible but password-protecting it. The best software hides itself

along with the folders so that only you know the utility is even installed.

Shred It

You likely know by now that stuff deleted from your hard drive, memory cards, and other storage media isn't really deleted at all. The OS "forgets" about it, but until the data is overwritten, it's still there waiting for snoops. The most advanced forensic packages can even recover data that's been overwritten a few times.

That's why you need a secure file-shredding method. These tools overwrite deleted data multiple times, and the best ones let you decide what shredding algorithm to use (such as Gutmann, which

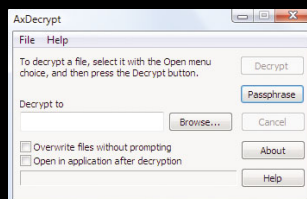
convert it into an executable file so you can share it with other authorized users even if they don't have AxCrypt. When encrypting, you can either password-protect the file with a passphrase or optionally apply a randomly generated keyfile to make the archive more secure. AxCrypt's best feature is its ability to let users enter a passphrase when they log in to the computer and then gain instant double-click access to all encrypted files protected with that passphrase for the remainder of the session. The software is easy to use and has a small footprint, and the only real downside is that it only supports 128-bit AES encryption. (And that's only if you use a passphrase with at least 22 characters or apply a keyfile.) A file shredder is also included, but because it just overwrites with random data one time, you're better off using a dedicated file shredder.

AxCrypt

Free

Axon Data

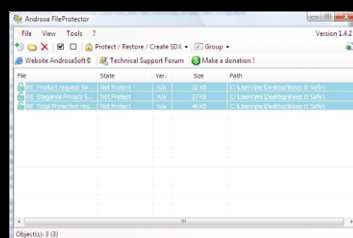
www.axondata.se



AndrosaSoft Androsa FileProtector

This is a highly configurable encryption program that supports more features than you'd expect from freeware. You can either install it normally on a PC or use it with a USB drive. It supports several encryption algorithms, including 256-bit AES, 192-bit TripleDES, and 64-bit DES. There are tons of settings, including a configurable file shredder that overwrites source files up to three times with random data after they are encrypted.

It's easy to create executable files that anyone can open with the proper passphrase, and the interface is terrific. Our only complaint is that when it encrypts entire folders, it encrypts the folder's contents but not the folder itself. This makes it easy for others to open the folder to see you have encrypted data stored inside (it has an .AFP extension).



Androsa FileProtector

Free

AndrosaSoft

www.androsasoft.net



File Hiders

Baxbex Software Folder Shield

Folder Shield renders files and folders invisible. Windows doesn't know they're there, you can't see them from a DOS prompt, and even malware can't find them. As far as everything on your system is concerned, the file paths to these hidden files and folders don't exist. You can hide or reveal anything you wish using the standard interface. And if you don't want anyone to know Folder Shield is installed, you can assign a hotkey that hides and reveals things. Sadly, this software is getting a bit old, and some of its features, such as the ability to restrict access to the Registry, aren't available in WinXP or Vista. That said, it's still superior to the hidden files setting that Windows uses.

Folder Shield

\$19.95

Baxbex Software

www.baxbex.com



Secure File Deletion

Heldi Computers Eraser

This is about everything a file shredder should be. Right-click context menu support is included for securely deleting individual files or folders, but there's also an advanced interface that permits scheduled deletions. Advanced users can call the program from a command line or batch file, making Eraser even more versatile.

Configurability is excellent. You can easily enable options, such as automatically erase the pagefile at shutdown, generate detailed reports, or run Eraser in the system tray at startup. The actual erasing options

overwrites data 35 times). Some let you schedule secure file deletions and securely delete existing portions of the hard drive. If you plan to get rid of a PC, look for a utility that can securely delete all of its drives via a boot disk, ensuring none of your data comes back later to haunt you.

The Mark I Eyeball

So far, we've just talked about software-based snooping, and for good reason. If someone wants to steal your data or monitor your usage, it's easy and inexpensive to just install an app and let it do all the hard work. Don't forget that hardware-based spying tools exist,

and physically inspect your PC if you think you've become a target. Is there a USB device inserted that you've never seen before? A keylogger placed between your keyboard cable and the keyboard port on the back of the PC? If so, treat every bit of data on your PC as if it's been compromised and prepare for the worst. To avoid this type of trouble, use software that locks down all of the computer's I/O ports and devices while you are away from the PC.

A Little Help From Your Friends

Security and privacy are tricky things to maintain even for the most experienced computer user, so don't forget

that there is an entire community of white hats on the Web waiting to help you. If none of the software featured here is working, you can't figure out how to use some of it, or you have the sneaking suspicion that there's malware lingering in your PC that nothing is detecting, be sure to download HijackThis (free; www.spywareinfo.com/~merijn). Run a scan and share the log with the user community at CastleCops (www.castlecops.com) or a similar site. They'll analyze it and do all the hard work so you can focus on maintaining a malware-free PC. ▲

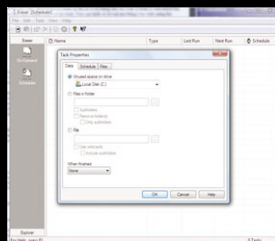
by Tracy Baker

are even more extensive: You can choose among a variety of erasing techniques, including Gutmann. A pseudorandom option also makes it possible to manually select the number of passes to make, and each option lets you also overwrite the cluster tip area, file names, and alternate data streams so that not a trace of the original files is left.

In addition to erasing files and folders, you can configure Eraser to delete all unused disk space securely, meaning it will shred remnants of files that were present before the software was even installed. You can also create a DBAN (Darik's Boot and Nuke) disc that will overwrite the contents of an entire drive.

Eraser

Free
Heidi Computers
www.heidi.ie

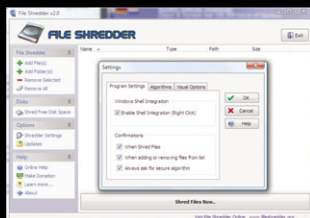


File Shredder

File Shredder works much like Eraser, only with fewer options. It enables instant shredding via an option on the right-click context menu and also has a slick advanced interface that lets you drag files and folders into a box before finalizing the deletion. The Gutmann algorithm is supported in addition to several quicker (but less secure) algorithms, and the software makes it easy to shred all free space on the drive, purging files that existed before File Shredder was installed.

File Shredder

Free
www.fileshredder.org



Standalone Software Firewalls

Comodo Group Comodo Firewall

Comodo is a rarity because it's free, even for commercial use. It works with all versions of WinXP and Vista, including the 64-bit

versions, and offers more configuration options and usage logs than most users will ever need. Even the interface is excellent, giving Comodo both the looks and the performance of a commercial-level app.

Comodo Firewall

Free
Comodo Group
www.personalfirewall.comodo.com

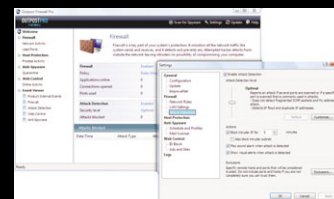


Agnitum Outpost Firewall Pro

This product combines a great firewall with antispyware abilities and is easy to use if you aren't familiar with the ins and outs of firewall configuration. It stores usage logs in plain text, making them very easy for experts to peruse, and the software automatically updates itself.

Outpost Firewall Pro

\$39.95
Agnitum
www.agnitum.com



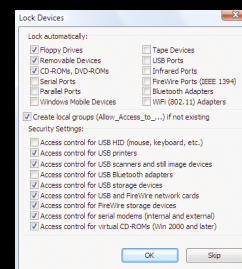
Hardware Locking

DeviceLock, Inc. DeviceLock

It's kind of amazing that a tool this substantial (it was designed for enterprise use) can be had for so little. DeviceLock shuts down nearly everything that involves Input/Output at your discretion, including USB, serial, and parallel ports; optical and floppy drives; and Wi-Fi and Bluetooth access.

DeviceLock

\$42
Device Lock, Inc.
www.device-lock.com

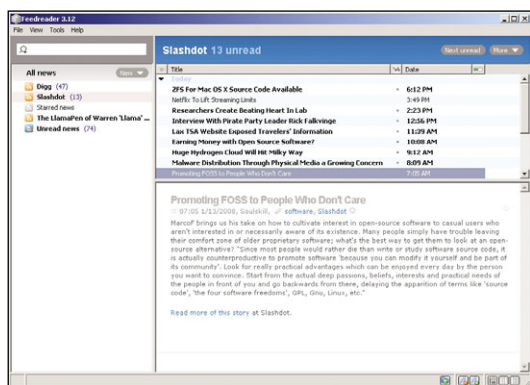




The Bleeding Edge Of Software

Inside The World Of Betas

FeedReader 3.12 Beta



RSS readers are nothing new, but that doesn't mean that development of even venerable titles stands still. FeedReader is now undergoing a rewrite from earlier versions that makes it leaner, meaner, and yet more feature-filled. Though it isn't without faults, it has the features and a way of working that might just click with the way you think.

the Thunderbird database, but there's a MySQL-based version available. Despite the database, FeedReader consumes only 4MB of RAM, and it starts and quits extremely quickly. Also, updates don't put a noticeable drain on even slower systems.

FeedReader follows the classic three-pane approach: feed sources in one pane, headlines in a second, and then the content

Official Product Name:

FeedReader

Version # Previewed: 3.12 Beta

Publisher: i-Systems

Developer and URL: i-Systems

www.feedreader.com

ETA: Q2 2008

Why You Should Care: The granddaddy of RSS readers proves it has a few new tricks.

The big news with the FeedReader 3.x branch is its use of an internal database to keep track of newfeeds. By default, it uses

of selected headlines in the third. Clicking a link either displays the source Web page within FeedReader or it launches your default browser. New posts in your feeds appear in an attractive and unobtrusive pop-up, though this can be disabled.

FeedReader has a lot more smarts than it used to. SmartFeeds, for example, keeps track of the postings you read and then highlights future postings based on it. It similarly keeps track of how often you manually update feeds and then updates them automatically based on your actions.

One thing FeedReader lacks is any integration with online RSS readers, and you can't integrate the feeds of two or more installations (such as between a work and a home PC), but it can work off a thumb drive for portability. Active development ensures new features get added and bugs get quashed, so it's a safe bet to try out the beta. ▲

by Warren Ernst

Ad Muncher 4.72 Beta Build 29715/1801

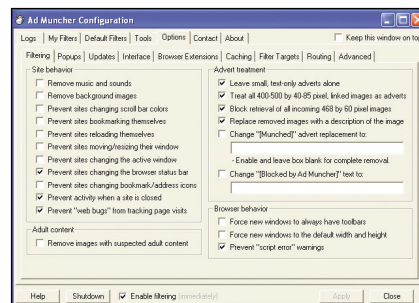
Most Web surfers who can't stand seeing advertisements in Web sites usually employ one of the "alternative browsers" and (if necessary) an ad blocking plug-in of some sort. Of course, while this can work pretty well, it only works for Web pages within Web browsers, so all the ads you see in IM programs, peer-to-peer programs, and almost any free software that displays ads, still show up. Ad Muncher aims to change this, and it does a pretty good job.

Much like Firefox's Adblock Plus, Ad Muncher blocks content from Internet servers it knows to be ads, based on the suggestions of its many users and developers. Unlike Adblock Plus, Ad Muncher works on a system-wide level, blocking content for all programs. It is smart enough to rewrite data streams so as not to break Web pages—ads just disappear, and content takes its place, so there's no empty

white space where the ad used to be. For programs with embedded ads, only blank space remains.

A small cow's head icon appears in the Taskbar Tray, and it "chomps" when it blocks an ad or stops a pop-up window. Right-clicking it lets you access the program's configuration screen, which is its only real GUI. There is a wealth of options available, ranging from removing annoying elements from Web pages (such as background music, background images, resized browser windows) to allowing ads to appear from certain Web sites or within certain programs.

All this goodness comes with a price: about \$30, depending on U.S. exchange rates with Australia. For this price, however, you get the developer's ear and can submit new sites or advertisements that annoy you. A screen within the options window allows for quick messages to the developers, so there's no need to jump to a



Official Product Name: Ad Muncher

Version # Previewed: 4.72 Beta Build 29715/1801

Publisher: Murray Hurps

Developer and URL: Murray Hurps

www.admuncher.com

ETA: Q2 2008

Why You Should Care: Living with advertisements on the modern Internet is worth something to somebody.

separate email program when you encounter something. ▲

by Warren Ernst

SPEED

UP TO

Upgrades That'll Keep You Humming Along

Both Microsoft and Apple battle for highest-profile upgrades this month. Movie rentals flow to iTunes, and new features have been added to the iPhone and touch devices. Upcoming Vista and XP service packs go into public beta. Media players from Creative and Microsoft also get firmware updates.

Software Updates

Alcohol 120% 1.9.7.66022

The CD/DVD-copying software adds a "pre-mastering" wizard named Alcohol Xtra. The reading and writing engines enjoy speed improvements. The memory buffer size can be increased to 1GB on x64 systems with more than 4GB of RAM and 512MB on x32 systems with 3GB or more of RAM.

www.alcohol-soft.com

AOL Instant Messenger for Windows 6.8.1.5 Beta 1

The AIM messenger gets real-time IM support. Now, you and a buddy can see what the other is typing as you compose the message.

dashboard.aim.com/aim

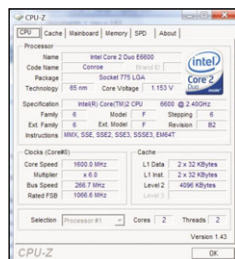
CCleaner 2.04.543

The system file cleaner now has a System Tray icon to indicate background operations and gets a Minimize To Tray option. File deletion routines and Firefox file analysis have been optimized, and Netscape 9.0 is supported now.

www.ccleaner.com

CPU-Z 1.43

The diagnostic tool that delivers information on your system's processor now supports Intel Skulltrail, x48 chipset detection, and AMD Athlon



64-LE 1600/1620. It also fixes a detection issue involving unlocked Phenom CPUs.

www.cpubid.com

iTunes 7.6

Movie rentals are the major reason for this refresh. A downloaded film (\$2.99 and \$3.99 each) must be started within 30 days of delivery. You have 24 hours to watch the entire film once starting it.

www.apple.com

Microsoft Windows Malicious Software Removal Tool 1.37

For Windows Vista, XP, 2000, and Server 2003, the latest version of the malware detector looks for select infections, such as Blaster, Sasser, and Mydoom, and tries to remove them.

www.microsoft.com

Winamp 5 Full 5.52

This upgrade provides better Unicode filename support for select decoders. There is also better support for APEv2 tags and onboard Intel graphics chips.

www.winamp.com

Windows Vista SP1 Refresh

The latest iteration of the upcoming service pack for Vista is a release candidate that is now open to public use. Microsoft is promising stability and performance improvements over the initial Vista release.

www.microsoft.com

Windows XP SP3 RC

The next update for WinXP goes public with its release candidate. This update rolls up all fixes and patches since WinXP's

initial release and adds some Vista features such as keyless installation for IT managers and Network Access Protection support.

www.microsoft.com

Driver Bay

ATI Catalyst 8.1

The new Radeon drivers add MultiView support for hardware-accelerated OpenGL rendering across multiple graphics adapters in a single system. Fixes for games include BioShock, Half-Life 2: Episode 2, World in Conflict, and F.E.A.R.

www.amd.com

Creative ZEN Vision Firmware 1.42.01

This update reduces file transfer latency when transferring DRM-protected items. Adds FM recording for players with firmware version 1.40.03

www.creative.com

Creative ZEN Vision W PlaysForSure Firmware 1.10.01

This update to the media player enables transfer of audio tracks longer than 18 hours and optimizes photo thumbnail capability with Windows Media Player 10 and 11.

www.creative.com

iPhone 1.1.3

A major update of iPhone's OS lets users rearrange and customize home page items. SMS messages now can be broadcast to multiple recipients. Google Maps now finds your current location without GPS.

www.apple.com

iPod touch 1.1.3

Although it costs \$20, this major update of the touch adds iPhone-like apps. Mail, Google Maps, Stocks, Weather, and Notes functions come to the iPod.

www.apple.com

Zune 2.3

New firmware for Microsoft's media player fixes recent issues with stability, device recognition, and syncing.

www.zune.com

by Steve Smith

Partition & Boot Managers

Divide & Conquer

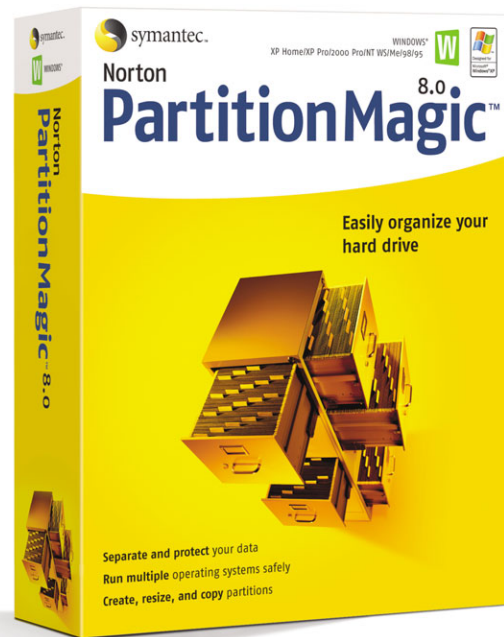
The best thing about today's enormous hard drives isn't all the space they give us to install hundreds of games and store thousands of hours worth of multimedia. It's the fact that they give us so much room to play when it comes to using multiple operating systems. Many legacy applications still don't work with Vista, so why not keep a copy of Windows XP at the ready to deal with them? Or maybe you have a Win-dows box and need to work extensively with Linux, but using a virtual machine isn't going to cut it. You can do all of this, or just chop a large drive up into several parts to manage it more efficiently, thanks to partitioning software and boot managers.

We looked at a number of these utilities to see which ones do the best job of helping you manage a hard drive. Just remember that the first step when partitioning is to get your hands on a good backup utility and copy all of your important data. Chances are slim that things will go wrong if you use any of our recommended utilities, but if something does happen during these types of low-level operations, it's usually disastrous.

Some of the utilities we tested may require that you burn an ISO file to a CD to create a boot CD. You'll need software such as DeepBurner Free (free; www.deepburner.com) or Nero 8 Ultra Edition (\$99.99; www.nero.com) to handle the ISO files. When using boot CDs, you may also need to adjust your BIOS to change the boot order so the PC boots from the optical drive before switching to the hard drive.

When partitioning, we recommend you execute one operation at a time to reduce the chances of something bad happening.

Partition Magic 8.0
Norton
\$69.95
www.symantec.com/norton/index.jsp



The best partitioning utilities let users queue up several actions (such as resize, format, move, etc.) and then click a single button to execute them in order automatically, but you're better off taking the time to manually apply the first action, make sure it went well, and then manually apply each remaining action, checking as you go.

Partition Magic 8.0

Back in the day, those of us who wanted a solid partitioning/boot management tool reached for our copies of Partition Magic. Nowadays, the software still works well and has a great interface, but it badly needs an update compared to the competition and doesn't support Vista yet.

The installation CD also works as a boot CD, however, in case you want to bypass the OS entirely. The partition manager supports FAT16, FAT32, NTFS, Ext2, and Ext3 and lets you create partitions up to 300GB in size. It can also convert back

and forth between FAT16, FAT32, and/or NTFS. Honestly, these are the core abilities most of us need, but the fact remains that even free tools like GParted (see sidebar) offer many more features. This is still a good combo for Windows XP users, but those looking for a partitioning tool they can use within Vista should opt for something else.

BootIt Next Generation

Although this software's name implies it's a simple boot manager, it actually has some decent partitioning abilities, as well. It creates, copies, moves, and resizes FAT16, FAT32, NTFS, Ext2, Ext3, and ReiserFS partitions up to 2TB in size. Better yet, resizing of FAT16, FAT32, and NTFS partitions is nondestructive, and the software can undelete partitions when accidents happen. BootIt is installed from a boot disc and runs before the OS kicks in, so it works with

any i386-based OS that uses a Master Boot Record.

The boot manager is among the best available, providing a GUI instead of a simple text list for selecting operating systems. One of its most interesting features is Multi-OS, which lets you run several operating systems that use FAT32 from a single partition instead of requiring them all to have separate partitions. This lets users set up a single legacy OS partition that contains Windows 95, Windows 98, Windows Me, Windows 2000, and Windows XP, for example. Vista requires NTFS so it'll need its own partition. You also need to install each separate OS to its own directory and prevent the installation Wizard from formatting the partition. If you already have a dual-boot configuration using two of these operating systems, the software can convert it to a Multi-OS configuration with only a few simple clicks.

Most people will want to use the software the way we used it for most of our testing, which is to boot multiple operating systems off of their own discrete partitions. If you use the software in Normal mode, which makes it compatible with other partition managers should you use those, you'll be able to create up to four primary (bootable) partitions. That's all well and good, but if you choose to rely solely on BootIt for your partitioning needs, you can choose a mode that allows for virtually unlimited partitions. Using the software, you can boot to any of them, providing terrific flexibility if you want to run more than a handful of OSes on the same machine.

Although the BootIt interface is good, this software is powerful enough that you'll need to spend a lot of time coming

Freeware Picks

This article highlights some of the best commercial partitioning and boot management software, but the open-source community has graced us with a couple of great free picks that you'll want to look at whether you're a pauper or a prince.

GParted is an outstanding tool that continues to become more powerful and gain new features with each release, and the 3.4-11 build we tested comes highly recommended. The software runs off of a boot CD, making it OS-independent, and it provides a slick, mouse-driven GUI that makes it easy to perform partitioning tasks.

The number of supported file systems is staggering. You can perform any type of partitioning activity on the usual suspects such as FAT16, FAT32, NTFS, Ext2, Ext3, and ReiserFS, but the software also has limited support for HFS, HFS+, JFS, Linux-Swap, Reiser4, UFS, and XFS. It can move and copy all of these more exotic file systems and also can create partitions using any of them except HFS+ and UFS. Overall, GParted offers that rare combination of software that is easy enough for novices to grasp yet powerful enough to suit the needs of enthusiasts.

If you opt for GParted, you'll need a nice, free boot manager to go along with it, and GAG is a perfect partner. It boots up to nine different operating systems from any primary or extended partitions on any hard drive, and you can't argue with that kind of flexibility. Or the price. ▲

GParted (Gnome Partition Editor)

Bart Hakvoort

Free

gparted.sourceforge.net

GAG (Graphical Boot Manager)

Raster Software Vigo

Free

gag.sourceforge.net

to grips with its capabilities. This is a terrific and flexible tool for managing tons of operating systems for those willing to put up with the learning curve.

Disk Director Suite 10.0

This drive management and repair tool includes a robust partition manager and a boot manager, making it easy to install multiple operating systems on one PC. Partitions can be created, deleted, split, or merged, and the merge feature lets users combine partitions that use different file formats. The software has built-in support for FAT16, FAT32, NTFS, Ext2, Ext3, ReiserFS, and Linux SWAP, and if you

happen to use a different file system in the future, the software offers sector-by-sector support for formats it doesn't recognize.

Boot disc support is extensive, and you can put the entire suite on the bootable media of your choice. The software recognized our DVD burner and USB memory stick and also gave us the option to create an ISO image that could be mounted using a different program. The entire suite requires only 29.66MB, and we tested it using the CD media option. When the disc boots, you get the choice of running the entire suite in Normal or Safe mode, but in our tests Safe mode was the only one that recognized our USB mouse. This is important because the bootable version uses the same mouse-driven GUI as the Windows suite.

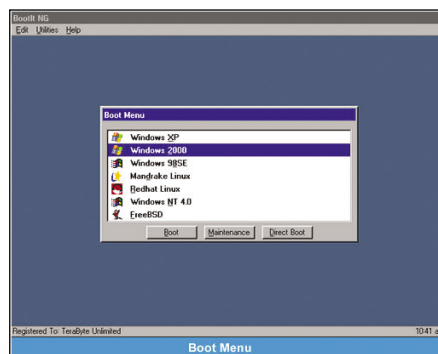
In the Windows version, we really liked the Create Partition Wizard, which let us use either a text box or a slider to select the size of the new partition. The nicest thing about it is that selecting any of the options displays a detailed description of that selection. This is a Godsend for novices, especially those unfamiliar with the differences between the various file systems this

BootIt Next Generation

TeraByte

\$34.95

www.terabyteunlimited.com

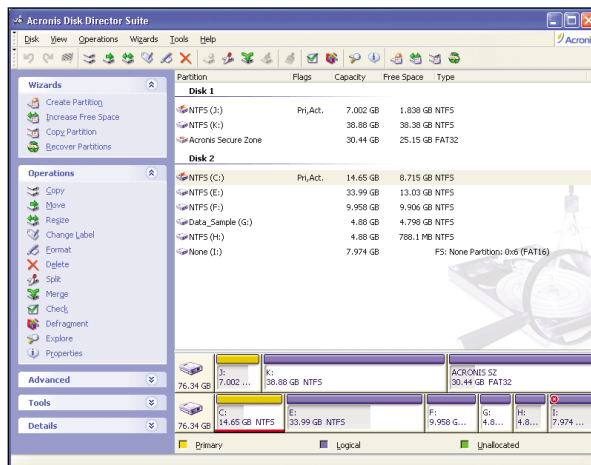


Disk Director Suite 10.0

Acronis

\$49.99

www.acronis.com



software supports, and it will even help experts avoid silly mistakes.

You can select to not format the partition with a file system in case you want to let an install CD take care of that for you, and all changes are displayed in the main menu so you can look things over before applying anything. This software works well whether you're running it in the OS or from a boot disc, and is a great all-in-one utility for managing multiple operating systems.

Partition Manager 9.0

This partitioning and boot management software was updated to version 9.0 just as this article was being written, and many of its new features are very useful. It now supports Vista, and like Disk Director Suite, its merge feature lets users combine NTFS and FAT32 partitions. Some other key features include the ability to convert back and forth between FAT16/32 and NTFS without losing data and its ability to grow

NTFS partitions without requiring a reboot. It supports NTFS, FAT16, FAT32, Ext2, Ext3, ReiserFS, and Linux Swap2 and now has an integrated backup utility so you can copy your important data before performing partitioning tasks.

Unlike many other packages, Partition Manager is designed to be run directly from the OS, and Paragon doesn't recommend using it from a boot disc unless you have to. We did test out the product's ability to create a recovery CD, which was very nice because the advanced mode let us add any other files we selected to the boot disc's root folder. The integrated burning app took only a few seconds to spit out a recovery CD containing most of the tools available in the Windows version of the software. Booting it launched an impressive mouse-driven GUI that provided access to a number of tools, ranging from basic partitioning to full drive copying. There are also several disaster recovery options for recovering deleted

What About Vista?

Vista has basic built-in partitioning abilities you can use if you don't want to mess with third-party software. To access the tool, click Start, right-click Computer, click Manage, and click Disk Management. Each installed drive is listed in the right-hand pane. Each block next to the drive name represents a separate partition, and you can right-click any of these blocks and then click Extend Volume to make it bigger, Shrink Volume to make it smaller, or Delete Volume to get rid of it. After shrinking a volume, you can right-click the block representing the empty space you created and then click Format to format the partition and assign a drive letter to it. If you want to use the partition with a Linux distribution just skip the formatting step and let the Linux distribution media take care of things during installation. ▲

partitions, updating the MBR, and correcting BCD (Boot Configuration Data) and boot.ini files.

Although it is possible to operate the software in an advanced mode that provides access to each individual feature, much of its utility comes from the wide variety of Wizards that walk you through the most oft-used tasks. These pretty much eliminate the learning curve for those who only need to deal with the basics of partitioning. The boot manager is also easy to set up and works well, making for a very compelling package.

Partition Politics

Acronis Disk Director Suite and Paragon Partition Manager 9 are both great values for the money, but the software of choice for power users is BootIt Next Generation. It is extremely flexible once you learn how to tap into its feature set, and it'll let you run as many operating systems as you wish. That said, even billionaires should take a look at GParted, which hides a lot of power behind an extremely user-friendly interface. Combine it with a free boot manager such as GAG and you have a nice open-source combo for managing your drive. ▲

Partition Manager 9.0

Paragon

\$39.95

www.partition-manager.com



by Tracy Baker

Believe it

Antec
Believe it.



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WHERE AMERICA BUYS TECHNOLOGY



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THE COMPUTER DEPARTMENT STORE

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Uniblue ProcessScanner

The premise is fairly straightforward: Uniblue ProcessScanner scans your computer and lists all the various processes that are running. The software is a free download from www.processlibrary.com and installs with just a few clicks through a simple setup wizard. When I launched the program, it automatically asked me if I wanted to scan for processes. The scan itself took less than 30 seconds.

I had 61 total processes on my computer, and ProcessScanner told me the file name, whether the process was a security threat, and what program it was associated with. When I clicked a file name, I was greeted by a detailed set of results for that particular file, including a description of what exactly the file was and what I might do with it. It also gave me details such as the file path, how large the file size was, and how much memory it was using.

The user interface, which opens in a browser window, is clean and intuitively easy to navigate. You can quickly sort through the scan results by simply clicking one of four tabs: Security, Network, Performance, or Autostart.

ProcessScanner suggested I “Scan For Errors” for each line item. However, when you click the link, you’re redirected to a page on Uniblue’s Web site where you can download more software. But when I downloaded and ran the new software, it asked me to purchase additional software. The above process repeated itself with yet another piece of “free” software from the Uniblue Web site.

Still, ProcessScanner worked fast and gave me all the information I needed on

all my PC’s processes. The software did detect a Trojan horse, which I was able to eliminate—just not with any of Uniblue’s (not) free software. ▲

by Seth Colaner

All Processes

Security

Network

Performance

Autostart

Search Term:

Show Modules

Show Processes

Running Processes

File name	Product name	Status	Security	Performance	Network	Source	Recommendation
1 explorer.exe	Adobe Photoshop Album Starter Edi...	Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
2 system32\devcon.exe	Apple Mobile Device Service	Running	Unknown	Low Memory Usage	Service	Scan For Errors	Scan For Errors
3 cmd.exe	Camtasia	Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
4 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
5 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
6 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
7 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
8 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
9 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
10 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
11 explorer.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
12 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
13 csrss.exe	Microsoft® Windows® Operating Sy...	Running	Running	High Memory Usage	Process	Performance Scan	Scan For Errors
14 csrss.exe	Google Toolbar®	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
15 hccmon.exe	BDK Monitor Application	Not Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
16 podex.exe	iTunes	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
17 ksmshelp.exe	iTunes	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
18 jtsch.exe	2nd2TV Platform 5.4 U3	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
19 lsass.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
20 lsass.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Process	Scan For Errors	Scan For Errors
21 msass.exe	Microsoft® Windows® Operating Sy...	Running	Running	Low Memory Usage	Service	Scan For Errors	Scan For Errors
22 processmon.exe	ProcessMonitor	Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
23 processmon.exe	PowerISO Virtual Drive Manager	Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
24 csrss.exe	QuickTime	Not Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
25 explorer.exe	Adobe Acrobat	Not Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors
26 csrss.exe	RealPlayer	Not Running	Running	Low Memory Usage	Autostart	Scan For Errors	Scan For Errors

ProcessScanner
Free
Uniblue
www.processlibrary.com
● ● ● ● ●

SageTV Media Server For Windows Home Server

Call me headstrong, or a male stereo-type, but I didn’t read the SageTV Manual before I tried to install SageTV Media Server for Windows Home Server. (When was the last time anyone read a 263-page installation manual?) I paid for my haste with several hours of frustration and software crashes.

To make a long story short, this software is finicky. I spent a good bit of time running down error messages and downloading this or that bit of software to make SageTV run properly. To be fair, I installed SageTV Media Server on a computer running Windows XP (there weren’t any spare Windows Home Servers lying around to test with); if you install the same software on the bare-bones Windows Home Server, you may not have as many installation issues.

The software is essentially a version of SageTV Media Center that is designed to act as a media server on Windows Home Server. You can store and organize photos, music, and movies in directories on

the server that are simple to set up. Once you’ve configured a TV source, you can watch and record live TV and use DVR functions such as Pause, Rewind, and Fast-forward. One nice feature of the online services is that SageTV has a list of video sites you may want to frequent, such as YouTube and sports Web sites; each is organized into categories for streamlined browsing that doesn’t require you to leave the SageTV interface.

Basically, SageTV Media Server is almost exactly like Windows Media Center. The only pronounced difference between the two is that they have different UIs. I’m puzzled as to why Windows Home Server doesn’t come with WMC but is compatible with virtually the same piece of software from a third-party company. Whatever the case, if you’re looking for a media center-type experience on a Windows Home Server,

SageTV Media Server will work for you (as long as you read the installation instructions first). ▲

by Seth Colaner



SageTV Media Server For Windows Home Server
\$79.95
SageTV
www.sage.tv
● ● ● ● ●

MojoPac Freedom

Most people are aware of the two “traditional” ways to run software directly from a thumb drive or portable hard drive: the so-called “Portable Apps” available from portableapps.org and the U3 system that works with U3-compatible programs. MojoPac Freedom is now a third method, and it works with pretty much every program we threw at it (which is good), but it does so at the expense of speed (which isn’t). For some, it’s a worthy tradeoff.

The first slowdown is installation. Oh, it is relatively painless, but it takes a good five minutes, even on a recommended piece of hardware such as an iPod. The main reason for this is that MojoPac Freedom is copying a lot of files into a second portable Windows folder, but that’s what most applications need in order to be portable. Once installed, you run MF on your portable drive, and a second Windows Desktop appears, rather like a full-screen Virtual Machine, complete with

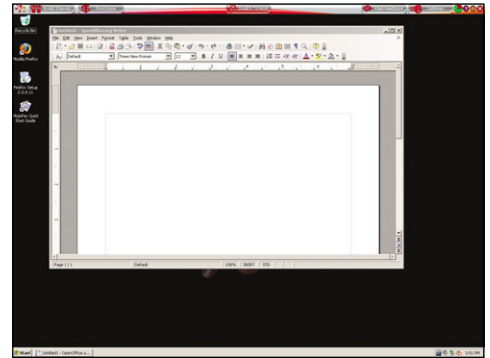
its own Start Menu and Taskbar. From there, you need to install your software that you want to make portable—it automatically winds up on the portable drive and leaves no traces on the host machine.

Nothing reminds you that external USB drives are slower than their internal counterparts than trying to run PhotoShop or Flash from one, but run they do, which is sort of amazing. Enabling write-behind caching in Windows helps, but you must manually set it yourself. (Check the MF documentation.) Counterintuitively, most complex applications run faster from an iPod than a flash drive (MF “boots” and OpenOffice Write opens in 1:15 (minutes:seconds) from a SanDisk Cruzer vs. 50 seconds from a hard drive-based iPod), but if they exist, PortableApps versions of programs run much faster (15 seconds for OpenOffice Write on the iPod, eight seconds on the Cruzer) and take up less space.

Basically, if you require an application to run from a portable drive that doesn’t

have a PortableApps or U3 version, then MojoPac Freedom is a good way to go. In fact, it’s the only way to go. If these other versions exist, however, you’ll get better performance by using them instead. ▲

by Warren Ernst



MojoPac Freedom

Free

RingCube Technologies

www.mojopac.com



NTI Shadow 3

Most backup programs are fairly similar: You set up a backup routine by designating the files to be backed up, a destination for the backup, and a time to automatically run the backup job. NTI Shadow lets you do these sorts of “conventional” backups, too, but it has some unique and innovative backup methods that are probably more like what most people want in a backup: complete “set-it-and-forget-it” file mirroring. Though not completely gotcha-free, we found NTI Shadow 3 to work smoothly and at a bargain price.

NTIS3’s backup scheme is more like file mirroring: Backups are really just whole copies of files. This doesn’t save space on your backup device since there’s no compression, but it does make it easy to recover files during an emergency because you don’t need to install a restore program to get your files. Classic backup scheduling is available, but STIS3 can back up files as soon as they’re updated in real time, assuming your destination device is available. We

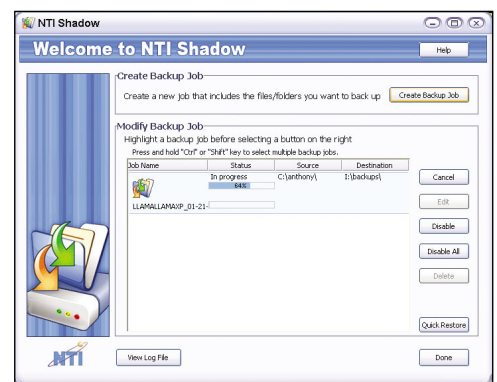
installed a second internal hard drive and set up NTIS3 to back up and automatically watch a folder with more than 18,000 data files (mostly MP3s, JPEGs, and Office files) totaling about 4.2GB, and it copied the files in under seven minutes. As we added and altered files in the watched folders, NTIS3 backed them up (though somewhat slowly) in the background, usually within a few seconds after we were finished with the files, taking between 15 and 30% of our CPU cycles, which still let us work on other things. It isn’t intended to back up a Windows installation and all of its open files, so we didn’t try it.

If the destination drive is removable, such as a thumb drive or USB external hard drive, NTIS3 keeps track of it and performs the backup automatically when the drive is inserted, allowing for using specific thumb drives to automatically back up specific file types from a source folder, which is a neat trick.

Such backups require NTIS3 to run automatically at the Windows startup, but it failed to do so on one test machine

(we later set it manually), so double-check your backups before relying on it. That bugaboo aside, we consider NTIS3 to be among the easier and more straightforward backup programs available. ▲

by Warren Ernst



NTI Shadow 3

\$29.99

NewTech Infosystems

www.ntius.com/shadow.asp



Dialogue Box

by Chris Pirillo

I, Geek

The world seems to be full of all kinds of potential geeks—power users waiting to happen. They just need to find other geeks who are equally as passionate about life and knowledge and willing to impart their knowledge with passion.

I was on vacation in January (a completely forced vacation, mind you), with an opportunity to mix and mingle with hundreds of nontechnical users . . . er, people. During this trip, I lucked upon a fantastic little whale-watching excursion at the last minute.

Upon boarding the tiny vessel, we were immediately immersed in a cetacean crash course. The tour guide was shooting facts at us left and right. He was begging the crowd for questions and supplying odd facts in the typical silence that ensued. During a break, I asked about his educational background, assuming he had some kind of higher education.

"I'm just an enthusiast."

Our discussion continued. He brought up his slightly out-of-date Web site and tales of broadband woe. (We've all been there.) However, if he was a geek, he was very little more than a whale geek. I suggested a few things that I knew were very powerful yet not tremendously difficult to apply and run forward with.

"I am trying to get new videos up there," he lamented. I suggested YouTube, and when he pressed me for a solution for YouTube video extraction (yes, even non-power users want to do that), I suggested vixy.net. He was stuck with dial-up at home, so I recommended a mobile broadband option for him to take on all his excursions, with full connectivity to stream live video out to the Web for free (much like I do every day through www.ustream.tv). We talked further of blogs and guestbooks, and the conversation ended with me showing him his Web site on my iPhone.

On the journey back to my accommodations, I was tapped on the shoulder by an elderly woman. She asked me if I knew a lot about blogs. She overheard my conversation with the whale geek. Seems she's wanted to set up a blog to put photos and

videos on, though she was somewhat unsure of how to complete the puzzle. In addition to pointing out a few user-friendly features on my current compact digital camera, I clued her in on Flickr and gave her some tips for using Picasa. She thanked me and explained that she was a real estate geek of sorts.

Maybe my seemingly simple suggestions may give my new whale and real estate buddies the ability to do something they never thought they'd be able to do. They were just waiting for someone to give them the tech answers that had long eluded them so that they might harness the power of the Internet much like power users do every day (and far too often take for granted).

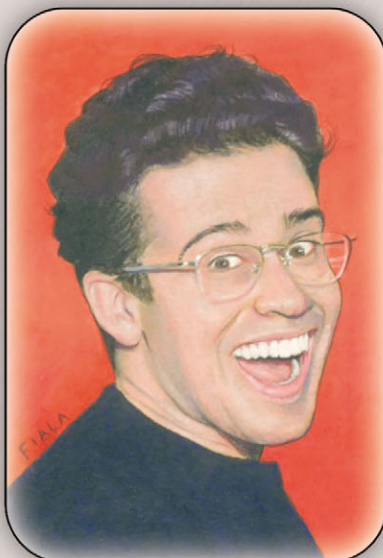
Does someone need to know the difference in clock speeds between two processors to understand what those processors would enable them to do (or do better)? Are they any less of a power user because they may not understand every aspect of a technology to know how it might be applied to their own wants and needs? I'd argue "No," because true power lies not just in knowledge, but knowing the right way to apply such knowledge.

And sharing that knowledge? That's 10 times as powerful.

I guess it's more than naïve of me to believe that people might share their knowledge openly. But what did it hurt me to explain to someone how to use a tool? And what good could that explanation do the world, potentially?

So I ask: What are you, as a computer power user, doing to help other people understand more about computers and technology? There's only one way for you to answer that question, in my opinion. How many educational opportunities have you passed up, inadvertently or overtly? How many kinds of non-computer power users do you know?

Don't waste your power. It's 100% recyclable and safe for the environment. ▲



Chris Pirillo does enjoy the occasional vacation, so long as there's broadband access available to him. He doesn't like to travel, largely because his inbox fills up to unmanageable levels within 24 hours of departure. Still, while away from home, he does his best to update his blog at chris.pirillo.com, stream live video recordings at live.pirillo.com, help others make money from blogging at lockergnome.com, enable people to find coupons and deals at tagjag.com, and plan future Gnomedex tech conferences for other passionate geeks. More than any other R&R style, Chris enjoys taking cruise ships to somewhat remote destinations. He's usually the youngest person aboard by 70 years.

You can dialogue with Chris at
chris@cpumag.com



Aluminum Gaming PC Chassis - **ARMORSUIT**

Built for Gaming Enthusiasts



PC-P80

PC-P60

Lian Li 2008 new high-end PC chassis for Gamer has arrived! ArmorSuit PC-P80 is the world first case which has three 14cm intake fans in the front, total of five large cooling fans to ensure the best cooling performance, and also it is the first one supports two liquid cooling systems.

ArmorSuit PC-P80 ready for today and future gaming! The PC-P80 has equipped 10 PCI slots, capable of supporting quad graphics cards system.

Upgrade your chassis to premium today! This will be the one, and the ultimate chassis for you. Contact your local Lian Li dealer for purchase information! And visit Lian Li web page for more detail www.lian-li.com

OLPC: One Large, Public Crisis

The trouble with trying to do good is that everyone else in the world thinks they can do better. That sums up the One Laptop per Child (laptop.org) saga so far. It's pretty easy for everyone else in the world to pile on and say it's no good: OLPC has missed almost every goal set in the three years since founder Nicholas Negroponte presented his \$100 XO laptop concept for the world's children.

OLPC has some powerful enemies—Intel and Microsoft, for starters. The Wintel duopoly doesn't like OLPC's XO, mostly because it competes with Intel's (*cough* ugly and overpriced) Classmate PC laptop designed for the exact same market as the XO. Half a year after Intel (finally) joined the OLPC Association last summer, they dropped out, once it became clear—when Intel sales reps attempted to undermine OLPC's 270,000-unit XO sale in Peru—that Intel wasn't interested in building XOs as much as selling Classmate PCs.

Consider the Nigerian kerfuffles: In 2006, Nigeria was reported to have ordered (and paid for) a million XOs; one year later, they reportedly canceled the sale in favor of Intel's Classmate. Tinfoil-hat-wearing Linux fans immediately started conjecturing about kickbacks. To add insult, a month later OLPC was reportedly hit with a seemingly bogus Nigerian civil lawsuit over a patent on its keyboard.

Early hype around the \$100 price tag and 1 million-unit minimum orders got OLPC the attention they needed to jump-start the project, but so far the cost per unit is hovering around \$200. Still impressive, but double the original vision. Despite "commitments" from and partnerships with nations around the world, including Peru, Rwanda, Uruguay, Thailand, Libya, Haiti, Nigeria, and Brazil, actual orders so far have been meager.

The hype-collapse generates bad press: *The New York Times* recently misreported (in a headline) that OLPC was dead. An *Economist* reviewer trashed the XO, not because it's underpowered, has a small keyboard, or couldn't do what he wanted it to (all true, apparently), but because it "has bugs that cause occasional crashes." (See tiny.cc/E2Njw.) I wonder how that reviewer feels about Windows.

Forget all that. The XO is an impressive achievement. From what I've read, reviews by and about kids who've used them unanimously praise the intuitiveness and fun of using them. Not surprising, considering the involvement of Seymour Papert, the guy who conceived the idea of computing for children back in the '60s with Logo. While it's hard for developing nations to justify spending \$100 million on laptops for their children, it's a no-brainer for

many Americans to spend \$400 (or more, on eBay) for a state-of-the-art learning appliance for their own children. Last holiday season, about 170,000 XOs were ordered under OLPC's G1G1 (Give One Get One) program, which donates an XO to a child in a developing country when you purchase one for yourself for \$399.

The XO's *almost* my dream computer: It's the size and weight of a notebook, is cheaper than just about every PC on the market, uses just a couple of watts, and runs open-source software. The keyboard *is* too small, though. I need an adult-sized XO, nothing more. I'd gladly pay \$300 for it; heck, I'd buy one for everyone in the family at that price.

I'll wait. I've been patient; I can wait a little longer. Here's why I'm confident. First, OLPC is a charity. They have donors, not investors. No VC's looking for profits or an exit strategy. Second, it's based on open-source software, so even if OLPC disappeared, someone else can pick up where they left off. Because sooner or later, OLPC (or someone else) will see that there's almost 50 million K12 students in the United States, and we spend almost \$500 billion on their education. Should the government spend \$5 to \$10 billion to outfit them all with XOs? That's a lot, but not A LOT. But I'd do it for my children if I could.

Would you?

Next month I promise I'll tell you what it's like to install and run Sugar, the awesome XO GUI. If you can't wait, try the Sugar LiveCD; visit wiki.laptop.org/go/LiveCd for a pointer to the download. ▲



Pete Loshin publishes LinuxCookbook.com, a place to learn even more about Linux. And don't forget to check out the new Ninitata.com, Pete's family-friendly fun and learning site.

You can get saucy with Pete at pete@cpumag.com

Stop Following Me

Anonymity & The Web



that many publishers and online advertising networks are planting browser cookies and using other means to track where we surf even as we think these high-profile media

companies are protecting us. According to researchers at the Annenberg School for Communications and UC-Berkeley, misunderstandings among consumers about online privacy and what privacy policies actually mean are rife. According to a 2005 study, 59% of online users presumed that sites that claimed to have privacy policies did not share user information with other sites and advertisers. In another survey of California residents, 37% of online shoppers falsely believed that privacy policies prohibit a site from analyzing a user's online activities.

In fact, a great many Web sites in some way track their users' behaviors while on the site and use that information with advertisers to better target ads to specific segments of their audience. The common practice among ad networks, "behavioral targeting," plants a cookie in your browser when you first see one of their ads on the thousands of partner sites that they serve. That cookie then tracks the kinds of content you read on a vast number of participating sites and uses that knowledge to serve ads that it thinks are more relevant to your interests when you visit other sites.

Yahoo!, for instance, has been doing this for years at its own massive portal, and its recent acquisition of ad network BlueLithium will extend that reach into millions of other users. AOL owns both Advertising.com, the largest ad network

online, and Tacoda, one of the first companies to introduce behavioral tracking six or seven years ago. Many interactive marketers believe that consumers are just fine with the tradeoff between seeing ads and getting content. The former head of behavioral ad products at Yahoo!, Rich Frankel, says, "There are a lot of privacy concerns among the consumer community, as well as the advocate community, but I think relative to those privacy concerns there is also a tremendous understanding and acceptance by consumers about what is happening online and why they get so many great services for free."

But the Annenberg survey found that when consumers were apprised of the very common model at work at most major media Web sites, they rejected it. In a study presented to the FTC last fall, several researchers told the FTC, "85% of those surveyed adults who go online at home did not agree that a 'valued' site should be allowed to serve clickstream advertising to them based on data from their visits to various Web sites that marketers collected and aggregated." In other words, the proponents of increased regulation contend that consumers are simply unaware of the tracking that is already going on among Web sites. And when consumers are made aware of behavioral tracking, the majority reject it.

The Privacy Plan

In late October 2007, a collection of 10 advocacy groups, including the CDT (Center for Democracy & Technology), the EFF (Electronic Frontier Foundation), and the WPC (World Privacy Council), proposed to the FTC a Do Not Track list that would effectively mimic the telemarketing Do Not Call registry so



Remember the days not so long ago when many dinner hours were interrupted by a wave of incoming pest calls from telemarketers? An act of Congress and the Federal Trade Commission in 2003 pretty much ended this national nuisance. The establishment of the Do Not Call registry has allowed over 150 million Americans effectively to eliminate unwanted sales calls and eat dinner in peace. Telemarketers are prohibited now by federal law to call anyone whose name is on this national registry. The program has been a success by any measure. Now that so much of the national economy has moved to the Web, many privacy and consumer advocates are pushing for a similar approach to prevent advertisers from surreptitiously following us online and constructing profiles of our online behavior. A Do Not Track mechanism would let consumers with a single click opt out of all attempts by advertisers to monitor their online activity, and 10 privacy groups in the U.S. now endorse it. 2003 was the year of Do Not Call. Will 2008 be the year of Do Not Track?

But why would we need a Do Not Track mechanism for the Web? Advocates of the plan say most of us are unaware

that consumers could opt out of all behavioral tracking online. While the idea is evolving as the groups tackle various technical issues, the Do Not Track model has five major parts.

Advertising entities that set a “persistent identifier” on a user device such as a browser or media player would need to register with the FTC the domain names or servers that place those identifiers on people’s computers.

Companies that make browser applications would add a function that allows the user to import the FTC’s current Do Not Track list of registered domains names so they can block those domains from tracking them.

The FTC would maintain this list in a public and accessible way so users can download an up-to-date version to limit tracking.

The FTC would engage in public education so users would know about the Do Not Track list and understand how to employ it.

Finally, the proposal does not promise or try to eliminate all advertising from the browser. Users will still get ads at publisher’s sites. They simply will not have their behaviors tracked by the publishers and ad networks.

A key concern for privacy advocates is that by tracking behaviors, companies can make decisions about a consumer that has real and negative consequences. “We are concerned about actions taken against consumers based on the choices they make online,” says Ari Schwartz, deputy director, CDT, a main proponent of the registry. Exploitive ads such as sub-prime mortgages or phony cures could be targeted to vulnerable populations, for instance. Different consumers could even be offered different prices for the same item because of inferences a behavioral tracking system makes about their income levels and need for an item.

One of the problems with online tracking is that the technology allows for many ways to profile our online activity. Even if a user regularly cleans his cookies, for instance, the Center for Democracy and Technology argues there are ways for sites to access your habits by viewing cookies

Network	Status	Opt-Out
aCerno More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
Advertising.com More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
AlmondNet More Information	No Cookie You have not opted out and you have no cookie from this network.	Opt-Out ☐
Atlas More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
DoubleClick More Information	No Cookie You have not opted out and you have no cookie from this network.	Opt-Out ☐
Mindset Media More Information	No Cookie You have not opted out and you have no cookie from this network.	Opt-Out ☐
Revenue Science More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
Safecount More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
SpecificMEDIA More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
24/7 Real Media More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
[x+1] (formerly Poindexter Systems) More Information	No Cookie You have not opted out and you have no cookie from this network.	Opt-Out ☐
Yahoo! Ad Network More Information	No Cookie You have not opted out and you have no cookie from this network.	Opt-Out ☐
TACODA Audience Networks More Information	Active Cookie You have not opted out and you have an active cookie from this network.	Opt-Out ☐
Select all Clear Submit		

The advertising industry insists that self-regulatory opt-out services such as the Network Advertising Initiative let consumers selectively remove themselves from tracking by the major ad networks and behavioral tracking companies.

embedded in Flash animation, browser caches and histories, and even in bookmarks, which some sites can view on your desktop via some browsers, the CDT says. Self-protection mechanisms are either too cumbersome or interfere with some performance benefits, such as a browser cache, the group argues. “Opt-out cookies are broken,” says Pam Dixon, head of the World Privacy Forum and one of the Do Not Track proposal’s sponsors. “We need a different approach, and I don’t think anyone has come to terms with that,” she says. As behavioral tracking moves off the desktop and onto mobile phones and set-top boxes for interactive TV, simply deleting browser cookies will not be enough, she contends. And attempts by the industry to self-regulate largely have failed, the privacy groups argue. The Do Not Track proposal is not a detailed and final solution, because even its sponsors admit that the groups are only beginning to research the technology necessary to deploy the model effectively.

And there is the rub, say many critics of the plan. “The idea of a Do Not Track list has serious challenges from an implementation standpoint,” says Bill Gossman,

president, Revenue Science, one of the oldest and largest behavioral tracking ad networks online. The plan would require almost all browsers and media players to include some mechanism that cooperates with the FTC-held list of tracking domains. And to be effective, argues Phillippe Coueignous, president of email privacy firm ePrios, “a solution must include the means to spot violations, gather the necessary evidence, and prosecute the offenders successfully.” Because behavioral targeting occurs surreptitiously to begin with, a Do Not Track violation would be very difficult and complex to detect, let alone prove, he argues in his FTC filing.

“And it’s not clear what the benefits are over an existing solution, such as users turning off cookies,” says Gossman. Many behavioral targeting companies do have mechanisms for opting out of their networks, and the Network Advertising Initiative (www.networkadvertising.org) is a consortium of 14 major networks (including Yahoo! and AOL’s Advertising.com) that lets you opt out from their respective networks at the NAI site. And more to the point, most ad networks insist that they do not collect PII (personally identifiable information) that ties a cookie on someone’s browser to their name, address, or any other personal information. The major players in the industry argue that they track users “anonymously” so that they are known to the network only as a faceless, nameless collection of browsing behaviors, not as a specific person. The problem is that many more smaller behavioral networks are not always clear about abiding by these industry standards, and most do not even participate in the NAI centralized opt-out program. And many others argue that “anonymous” tracking is a misnomer, that the technology allows an ad vendor or even a government agency to link anonymous histories to an IP address or other identifying data if they really wanted to.

Have An Ad: It’s Good For You

The IAB argues that advertising benefits consumers in many ways and that highly targeted behavioral tracking benefits them

Now owned by AOL, Tacoda Networks is one of several behavioral targeting ad networks that maintain tracking cookies on tens of million of browsers so that sites we visit will serve ads that are related to content we recently visited.

even more. "The rise of ad-supported services explains the movement away from subscription models," says Mike Zaneis, vice president of public policy, Interactive Advertising Bureau, in his letter to the FTC chairman. NYTimes.com recently dropped the \$49.95 annual subscription wall to its premium editorials, and NBC left the \$1.99-per-episode iTunes model to serve full episodes of its prime time schedule online for free, but with ads. These free-to-consumer models are possible now because the Internet has become a more hospitable place for advertisers where they can use the technology to find the right, interested consumer.

Advertisers are not pouring money into the Internet and supporting free content simply because they can plaster more ads indiscriminately all over Web sites. They embrace the Internet because its technology promises a more efficient, less wasteful way of sending ads only to people who are interested in the product and are most likely to buy it. "Internet advertising supports this growth by offering businesses a means to target consumers based on individual preferences and thereby deliver products and services of most interest to a particular consumer," says Zaneis. The two most successful online retailers, Amazon.com and eBay, are such effective businesses because they track their members' habits and use that information to personalize

their offers. Advertisers argue that behavioral tracking ultimately helps consumers by reducing the number of irrelevant ads we get. Some argue that a Do Not Track list might have the ironic effect of increasing the number of ads on sites. Publishers, who receive less ad revenue from poorly targeted ads, would have to use more lower-value ads to get the same revenue as their higher-priced, behaviorally targeted ads. According to Alan Chapell, president of Chapell & Associates, a privacy consultant to major media companies, "It's hard

to see how Do Not Track could possibly work for consumers. It would significantly hamper almost all current online media, marketing, and ecommerce-driven business models."

The Future Of Tracking

In December 2007, and after conducting two days of open hearings in Washington, D.C., the FTC decided not to recommend for now legislative action to regulate the behavioral tracking industry or the necessary laws that would initiate a Do Not Track registry. Instead, the Commission recommended "policy principles" that the advertising and publishing industries should adopt themselves. "The FTC is looking for each company to be responsible for their own privacy policy," says Dixon. The Commission wants to see clearer statements by providers about how data is collected and stored securely, and they want explicit opt-in mechanisms so consumers agree up front to receive behaviorally targeted ads.

While the FTC did not rule specifically on the Do No Track proposal, its proponents feel it is just a matter of time before some form of it gets adopted by some states and federal regulators. Behavioral tracking is only going to become a greater issue as companies such as Google and Yahoo! look to extend their ad networks off the Web and to new digital platforms in our pockets and living rooms. Dixon

says they have had repeated talks with officials "and they are very willing to continue to look at us and what we are developing." Schwartz predicts, "I think you will see things rolled out over a long period of time." Many states are interested in enacting their own Do Not Track legislation, but Schwartz admits these sorts of systemic changes in a medium have to suffer through long committee deliberations, changes of administrations, and technical issues that are not fully ironed out. Ultimately, the fate of Do Not Track lies in consumers and advocacy groups. "It depends on how much pressure is put on the industry, how much pressure the industry feels, and how fast they act." ▲

by Steve Smith

Infinite Loop

It's A Male Thing

For every man who's ever angered his girlfriend by his inability to shift his loving gaze from a video game to her eyes, a Stanford study has come to the rescue with an explanation. During the study, men and women were hooked up to an fMRI machine (measuring which parts of the brain are in use)



while playing video games. Although both men and women experienced activation in the region of the brain associated with reward and addiction, this was only a mild activation for women. Activation in this region of the brain was much higher for men, indicating that men are two to three times more likely to feel addicted to video games than women. So, gentlemen, even though you've already been accused of being a video game addict, now you have the research to prove it.

www.eurekalert.org/pub_releases/2008-02/sumc-vga020408.php

The Department Of Stuff

by Rob "CmdrTaco" Malda

socialnetworks.txt

Social networks have had a wild ride in the last few years. They've taken many forms, and I suspect that we're approaching the end of this as the frontier starts closing up and the leaders become the providers of the APIs that are eventually controlled by the old known entities: Google, Microsoft, and Yahoo!. The winner is yet to be seen, but at least you'll need fewer bookmarks to keep track of your friends.

I don't remember what the first social network invitation was that appeared in my inbox. Orkut seemed very popular for a while, but it seemed to be replaced with MySpace and then later on by Facebook. Now everybody seems to have an account on all of these systems, and on a daily basis, I get friend requests from any number of social network systems. Most of the time, these invites come from systems I have never heard of.

What has become more interesting in the last few years is that these systems are starting to find purpose. Originally they seemed to be little more than a vanity system. How many friends you had could be a badge of honor, with a number of minor celebrities arising into the mainstream media simply because of the number of friends they have in these systems. I actually find it very frightening that simply having a certain number of people click a Friend button can result in a reality TV show.

MySpace became a place for kids to express themselves. Facebook claimed to be for college and later businesses, but with its increased exposure and more lax allowance for inclusion, the line between these later systems and the earlier ones has become increasingly blurred.

These days, social networks pop up not for their own sake, but instead to distribute some service. I was recently asked to join a social network that would

allow me to track the location of my friends and their travel plans. A social network that hooks into travel planners, airline information, hotels, cities, and time zones. Interesting, I supposed, but would such a thing be worth re-adding the couple of dozen people who I actually care about? The tedious process of befriending people on a new system just to use one function is ridiculous.

The truth is that what we have seen is the rise of social networks

as a tool to get more important things done. Yahoo! has announced plans to use the concepts pioneered by social networks to improve your email inbox. This is a fantastic idea. It's one thing to use your address book to highlight emails from people you have contacted before, but it's completely another thing to group discussions to friends further out in your graph of relationships.

Like most people, I am contacted by close friends, distant friends, and of course total strangers. Using the relationships understood in a large social network, there's no reason that an informed guess at relevance can't be made algorithmically. And as a freebie, those messages unconnected to the social graph are far more likely to be spam. I wouldn't blacklist such a contact, but as food for a spam detector, it would be a powerful indicator.

The possibilities of using this data are infinite. At the end of the road, we have a system where all online systems interchange this data freely. Suddenly, the rating system in a discussion forum starts being able to recognize your friends. No longer am I required to re-acquaint myself with the dozens of people I care about every time I move to a new system. ▲



Rob "CmdrTaco" Malda is the creator and director of the popular News for Nerds Web site Slashdot.org. He spends his time fiddling with electronic gizmos, wandering the 'Net, watching anime, and trying to think of clever lies to put in his bio so that he seems cooler than he actually is.

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ROAD Warrior

by Jen Edwards

An "Instant" Revolution In Photo Printers

Polaroid changed the photographic landscape 60 years ago with the introduction of a camera that produced photos on the spot. Now, the company is aiming to make another change with its Digital Instant Mobile Photo Printer. What sets this printer apart from the others currently available is its ZINK Zero Ink technology. Instead of cartridges, the printer uses a special paper that has heat-activated dye crystals embedded under a polymer layer exterior. When heat is applied to the crystals, the crystals "activate" according to their appropriate color. As its name implies, there's no ink in ZINK prints.

The 8-ounce device measures 0.93 x 2.83 x 4.72 inches (HxWxD). It connects via USB cable to PictBridge-enabled cameras and also works with Bluetooth-equipped mobile phones. Photos print in less than a minute, and the unit can print 15 borderless 2 x 3 sticky-backed photos on a single charge of its rechargeable Li-Ion battery. ▲



Polaroid's Digital Instant Mobile Photo Printer lets you share your digital photos instantly, no matter where you are.

New Bags Do A Lot More Than Hold Your Laptop

These days, your go-everywhere gear bag should do a lot more for you than store your laptop, AC adapter, and accessories. Try the Wiffinder 200 (www.soyntec.com), which has an integrated Wi-Fi network detector that shows you the signal strength (but not SSID/encryption information) of surrounding 802.11b/g networks at the press of a button.

The bag accommodates laptops with screens up to 15.4 inches and also features a built-in clock, organizational pockets for supplies and small electronics, including

MP3 players. An adjustable shoulder strap, a removable padded laptop sleeve, and a three-year warranty complete the package. The Wiffinder is currently available in Europe for approximately \$50.

If green's your thing, check out the Voltaic Generator (\$599; www.voltaicsystems.com), a bag equipped with solar panels powerful enough to charge a laptop. Made mostly of recycled plastic bottles, the bag can hold up to a 17-inch notebook in a separate case. An interior battery pack stores the energy gathered by the solar panels on the front of the bag, and it can also be charged via AC adapter. Adapters are included for a variety of laptop brands and small electronics.

At \$599, the Generator certainly isn't cheap, but knowing you have all the power you need (or can generate cleanly from the sun) in order to get the job done is certainly priceless. ▲

The Voltaic Generator harnesses the sun's energy to power all of your portable electronics.



Mobility For The Masses At Wal-Mart

The Everex Cloudbook (\$399; www.everex.com) is the latest ultraportable computer to follow in the footsteps of the popular Eee PC. Available exclusively at Wal-Mart, the small wonder weighs only 2 pounds, and Everex promises five hours of battery life on a single charge. The machine measures just 9 inches wide but packs a 7-inch WVGA TFT display with 800 x 480 resolution, 1.2GHz VIA C7-M processor, 512MB DDR2, and a 30GB hard drive. 802.11b/g and 10/100 Ethernet networking options are included, as well as two USB ports, a Web cam, 4-in-1 card reader, mic port, stereo speakers, and a touchpad.

The system uses the Linux-based gOS Rocket and comes with a variety of preinstalled software, such as OpenOffice 2.3, Firefox, and xine. The OS' desktop includes quick links to Web sites such as Gmail, Wikipedia, YouTube, Skype, Blogger, and Facebook. ▲

Fujitsu's P1620: The Other Lighter-Than-Air Notebook

The MacBook Air made quite a stir at Macworld, but it isn't the only option. Fujitsu just announced the P1620, a 2.2-pound convertible tablet with an 8.9-inch WXGA 1,280 x 758 touchscreen display, an Intel Core 2 Duo U7600 1.2GHz processor, and up to 2GB of RAM. Hard drive sizes range from 40GB to 100GB, and a 32GB SSD option is also available. There's no touchpad, so a pointing stick located in the middle of the keyboard provides navigation. All of the standard connectivity options—802.11a/b/g, Gigabit Ethernet, and Bluetooth—are included. Two USB ports, a fingerprint sensor, and an SD card slot round out the package.

Windows XP Pro/Tablet PC Edition and Vista Business are all available for the P1620. Fujitsu's Portshutter application, which restricts the use of specified I/O ports and certain types of USB devices, improves security by preventing the transfer of confidential information via flash drive.

The P1620 measures 1.36 x 9.13 x 6.57 inches and comes with a standard 3-cell battery. (A 6-cell battery is available as an option.) Prices start at \$1,599, and Fujitsu expects the P1620 to ship by the end of the month. ▲



Fujitsu's P1620 could give the MacBook Air a run for its money.

New Devices From Clarion Take You Where You Want To Go

Although several exhibitors at CES introduced MIDs (mobile Internet devices), Clarion went a step further and showcased its MiND (Mobile Internet Navigation Device). The device is designed to combine the best features of connected devices with the navigational functionality of dedicated GPS devices.

Based on Intel's Menlow platform and featuring a 5.2-inch, 800 x 480 touchscreen LCD, the MiND has 256MB of RAM and 4GB of flash storage. It runs on Linux and connects to the Internet via Wi-Fi; you can also pair the device with a data-capable mobile phone via Bluetooth wireless networking. Future plans include a 3G data module and WiMAX compatibility.

Although still in the early design stages, MiND's promises a host of enticing abilities, including the following: viewing Flash and Web video content, viewing Office files and PDF, reading email and RSS headlines, and instant messaging. It also includes media player software. An integrated microphone lets you make hands-free calls, so you can talk on the phone and use the MiND's GPS navigation system simultaneously.

For users who don't need the MiND's extra connectivity and Internet features, Clarion also announced the EZDrive EZD580 (\$399.99). The unit has a 4.3-inch touchscreen display, 64MB of RAM, 2GB of flash storage, and an SD card slot that supports cards with up to a 4GB capacity. Full maps and 12 million POIs for the United States and Canada are pre-loaded, and the unit gives turn-by-turn, voice-guided directions. It also stores information for previous destinations, making it easier to receive guidance to frequently visited locations. The EZD580 also has a built-in MP3/WMV player and picture viewer, and a car cradle with window and dash mounting options is also included. The EZDrive EZD580 will be available this spring. ▲

Carry Your Essential Files In Style & Safety

SimpleTech has teamed up with Pininfarina, an Italian designer, to create a new line of portable hard drives that are both colorful and sleek, with capacities from 120 to 320GB and colors such as Blueberry, Mint, Bubble Gum, Kiwi, and Black Cherry. These USB 2.0 drives use a special Y-cable to connect to two USB ports, so no separate power adapter is required.

What sets these drives apart is the inclusion of both internal and external data backup functionality. Every drive comes with 2GB of online storage via Fabrik Ultimate Backup, and users can purchase unlimited online storage for \$4.95 per month. The service uses 128-bit SSL encryption during the upload process, and the backup servers are protected by 448-bit Blowfish encryption. The service will initially launch for PC users; a Mac version will be available late in the third quarter. Prices for the drives range from \$119.99 to \$229.99, depending on capacity. ▲

At Your Leisure

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest and most interesting releases in PC entertainment, consoles, DVDs, CDs, and just leisure and lifestyle stuff we (for the most part) love and recommend, read on.

Audio Video Corner

by Blaine A. Flamig



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The Mars Volta—"The Bedlam in Goliath"

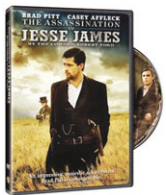
According to The Mars Volta's Web site, "The Bedlam in Goliath" is "one of the weirdest stories in the history of modern music, a tale of long-buried murder victims and their otherworldly influence, of strife and near collapse, of the long hard fight to push the record that did not want to be born out into the world." Uh, OK. We'll let you form your own interpretations of the meanings of the 12 wonderfully psychedelic and madly loud creations that Omar Rodriguez-Lopez, Cedric Bixler-Zavala, and company have conjured up for "Bedlam." Suffice it to say, with frequent collaborator John Frusciante of the Red Hot Chili Peppers again in tow, you're in store for heavy doses of experimental, guitar-laden jams on "Bedlam" that thankfully further serves as evidence that it's impossible to pigeonhole The Mars Volta into any one musical genre.



\$13.98
Virgin Records
www.lennykravitz.com

Lenny Kravitz—"It Is Time for a Love Revolution"

Lenny Kravitz has never been shy about letting his influences soar from his six strings. The Beatles, Sly Stone, James Brown, Hendrix, Prince, and The Stones have all shown up on Kravitz's records going back to 1989's "Let Love Rule," when Lenny was still Lisa Bonet's man. On the surprisingly solid "It Is Time for a Love Revolution," Lenny gets his Led out, gets his Red Hot Chili Peppers funk on, and gets in tune with Mick and Keith. Yeah, "Revolution" still possesses the occasional ballad from Kravitz to suffer through ("A Long and Sad Goodbye" would be touching if it wasn't so unbearable), but the opening track "Love Revolution," "Bring It On," "Love, Love, Love," and "Will You Marry Me" sway and bounce with such foot-stomping glorious buzz, you won't mind pressing fast-forward.



\$27.98
Warner Home Video
jessejamesmovie.warnerbros.com

"The Assassination of Jesse James by the Coward Robert Ford"

You already know the story of the outlaw Jesse James and how he met his untimely demise at the bullet of back-shooting Bob Ford, but that won't prevent you from enjoying "The Assassination of Jesse James by the Coward Robert Ford." Although slow-moving and over two hours long, "Jesse James" never fails to captivate, particularly visually. Roger Deakins' ("No Country for Old Men") brilliant cinematography supplies the ambience for riveting performances from Brad Pitt as James, Sam Shepard as older brother Frank, Sam Rockwell as Charlie Ford, and Casey Affleck as 19-year-old Bob Ford. Affleck's turn as the pathetic hero-worshipping Ford, in fact, is shockingly brilliant. Produced by Pitt and Ridley Scott and directed by New Zealander Andrew Dominik, "Jesse James" is Sunday afternoon movie watching at its most enjoyable.



\$29.99
Paramount
www.paramount.com

"Beowulf"

A bit of advice: Take your critical hat off before plunging into "Beowulf." What director Robert Zemeckis gives us in the CG-laden flick is entertainment, not an English lesson on epic poems. Originally released in 2D, 3D, and IMAX 3D versions, "Beowulf" gets its fire from the always-great Ray Winston as the boastful monster-killing hero Beowulf. Angelina Jolie provides ample seduction as the bewitching mother/dragon lady to the deformed monster Grendel (a creepily mesmerizing Crispin Glover). Anthony Hopkins, however, is surprisingly by-the-numbers as King Hrothgar, and John Malkovich (Unferth) and Robin Wright Penn (Queen Wealhthow) are dull in spots. Still, Zemeckis has greatly improved on the performance-capture technique he gave us in 2004's "The Polar Express."

DVD Byte

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The Living
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Lost Highway
The Invisible Man—
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See the full reviews from A/V Corner at www.cpumag.com/cpuapr08/AYL

Take Me Down To Paradise City -by Dr. Malaporop

\$59.99 (360, PS3) • ESRB: (E)veryone • Electronic Arts • burnout.ea.com

A big piece of the Burnout series' design centers on massive driver-orchestrated accidents that showcase torn metal and shattered glass. Burnout has made the act of smashing up your vehicle a thing of beauty.

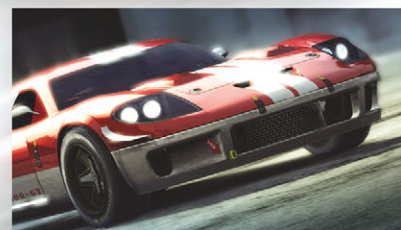
Developer Criterion's first entry into next-gen consoles was a PS2/Xbox port (very polished, but still a port) of Burnout Revenge in early 2006. We liked that game a lot, but Burnout Paradise is Criterion's first all-new, from-the-ground-up, next-gen console release, and its most ambitious to date. As indicated by the title and opening Guns N' Roses theme song, the game takes place in the sandbox locale of Paradise City. This massive, free-roaming environment is your playground, and exploration is strongly encouraged. Say goodbye to constrained race tracks and drive where you like, when you like. Randomly exploring the city at heart-pumping speeds with blurred traffic and scenery whipping by is fun upon entering the city for the first time, but slam on the brakes at a stoplight to begin truly playing.

By pulling up to nearly any intersection, you can activate an event. Obviously, races are fairly common, but other events include Stunt Runs, Road Rage, Marked Man, and Showtime. Stunt Runs set you on the roads in an effort to rack up as many points as you can in a limited amount of time. Accumulating points through combos, air, barrel rolls, and the like will bring a smile to your face. Road Rage provides you with the objective of a set number of Takedowns, and this increases as you advance through the

game. Marked Man sets you on a race, but you'll have to outsmart or outsmash all the cars that have it in for you. Showtime, which feels akin to a minigame, is activated by pressing both bumper buttons simultaneously. In Showtime, your car is launched into traffic and you attempt to smash as many vehicles as possible as your car spins, bounces, and turns through traffic. Gameplay is not limited to events; Paradise City is a haven for hidden roads to discover, massive jumps to fly over, and billboards to jump through, so there's plenty of variety. Another highlight of the game is the ease with which you can invite your friends into your version of the city. Press the D-pad and select up to eight players to invite those friends directly into your game environment. The game features hundreds of objective-based tracks to keep the pack entertained.

There are a few shortcomings with Burnout Paradise. Not having the option to restart a race after losing is frustrating for completionists that want to win a race before moving on. The game conveniently places races going back the other way, so you can redo the race, but restarting would have been a welcome option. Not having this option makes the overall design feel organic and unrestrained by menus. Notably absent is the Crash mode from Burnout 3 and Revenge, in which you threw your car into a packed intersection to achieve the ultimate wreck. Burnout Paradise seems to have all the requirements in place for a Crash mode, so perhaps it's been saved as future downloadable content. The rocking audio track fits well but

feels tired after playing the game for several hours, so it's nice to have support for customized music on the 360. Overall, Burnout Paradise is an exciting and entertaining arcade racer. Criterion did well to move the game to an open-world format with seamless integration to Xbox Live for additional multiplayer value. We won't be surprised to see other games copy the online functionality introduced in Burnout Paradise. It's time to strap back in to that four-point harness, so let's reconvene on the streets of Paradise City, shall we? ▲



ASSASSIN'S CREED™

A Life Once Lived -by Dr. Malaprop

\$59.99 (360, PS3); \$49.99 (PC) • ESRB: (M)ature

Ubisoft Entertainment • assassinscreed.com

As Assassin's Creed begins, you find yourself in the 12th century during the Crusades as an assassin named Altaïr. You soon learn that in the present day you are Desmond Miles and that Altaïr is one of your ancestors. You've also been abducted. It's revealed early on that DNA holds keys to our memories and that Desmond's captors are using the

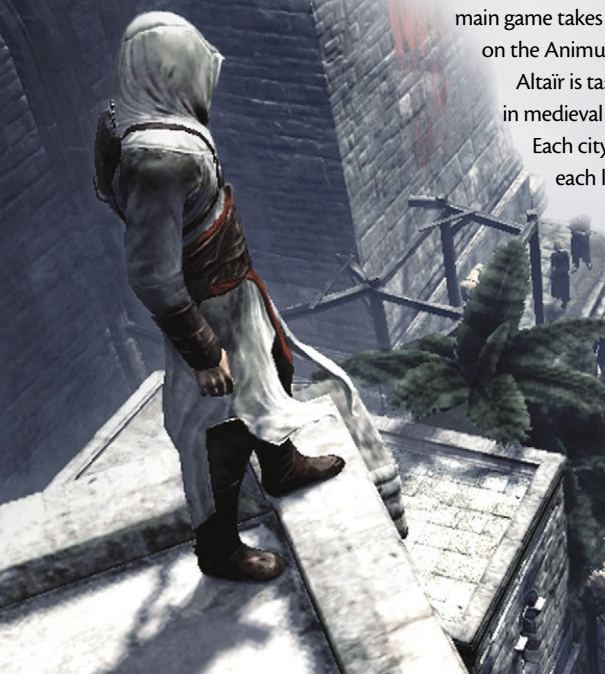
Animus machine to search Desmond's memories. The main game takes place during Desmond's sessions on the Animus as he "remembers" Altaïr.

Altaïr is tasked with assassinating nine leaders in medieval Jerusalem, Acre, and Damascus.

Each city is broken into three parts, and each leader is to be found in one of the nine available areas. As the game progresses, he unlocks more skills (counterattacks, special moves, weapons) that can be used to infiltrate and assassinate. The joy in playing the game comes from how alive the

world feels with its citizens and natural buildings. It's breathtaking the first time you ride up on one of the cities and take in the view. The entire game world is populated with thousands upon thousands of people, which gives the game its authentic ambiance. The other great pleasure comes from controlling Altaïr and experiencing his highly fluid movements—especially as you discover that you can climb nearly all the buildings and that the game's platforming elements are blended so seamlessly into its design.

Assassin's Creed features amazing moments but begins to feel repetitive about two-thirds of the way though. However, the storyline is intriguing and holds your attention to the end. Assassin's Creed: Director's Cut Edition with additional missions will be available on the PC as you read this. ▲



TUROK

John Rambo Approves -by Chris Trumble

\$59.99 (360, PS3) • ESRB: (M)ature • Touchstone • www.turok.com

When Turok: Dinosaur Hunter hit the N64 back in February 1997, console FPS games had finally arrived. Goldeneye 007 would hit the scene a few months later in August, giving the genre a more refined multiplayer experience and further polish, but Turok was a first in many regards.

Touchstone and Propaganda Games' new Turok release isn't the revolutionary experience the original was, as the bar for good FPS games is of course much higher these days. But thanks to nice visuals and sound, as well as solid control and flexible gameplay, the new Turok release still manages to impress.

As Joseph Turok, you have been attached to an elite special-forces team and ordered to travel into the reaches of space to an out-of-the-way planet to assist in capturing Roland Kane, rogue leader of a black ops unit called Wolf Pack and your former mentor. As a former Wolf Pack member, you don't get the warmest of welcomes from your new comrades, but the importance of a cozy group dynamic pretty much goes out the window at the outset

anyway, as your ship is shot down and crashes on the surface of Kane's planet. The world has apparently been terraformed and is an ecological nightmare where ravenous prehistoric predators pose a constant threat to human inhabitants, so as in earlier Turok games, you'll spend almost equal amounts of time fighting human enemies and dinosaurs.

The cool thing about this is it provides ample opportunities for both traditional run-and-gun shooter play and more stealth-oriented tactics. You can't really sneak up on a hungry raptor, so you'll have to rely on your fast-twitch reflexes, but when you face the game's numerous human combatants, you can (if you want) use silencers, your knife, and the game's trademark bow and arrows to proceed more . . . surgically.

Turok has some visual issues, and its levels tend to be fairly linear in design, but it looks very nice and boasts solid play mechanics and a stellar voice cast, including Ron Perlman, Donnie Wahlberg, William Fichtner, and Powers Boothe. Add to that its nicely crafted story, and you've got a worthy bearer of the Turok name. ▲



DEVIL MAY CRY 4

Raiden Says Hello -by Chris Trumble

\$59.99 (360, PS3) • ESRB: (M)ature
Capcom • www.devilmaycry.com



Capcom's excellent Devil May Cry franchise has finally made the transition to the current generation of consoles, and aside from some lengthier-than-usual load times and an initial 20-minute-plus installation of sorts on the PS3, the results are stellar.

In a nutshell, DMC4 serves up everything you've enjoyed in the first three games, including blisteringly fast third-person action that unfolds with operatic grace, scads of cool enemies and ginormous bosses, and a healthy dose of attitude. You're still graded on how well you

complete each level (and how stylishly), and you still collect monster drops and spend them like currency in upgrading your weapons and skills.

One design/story item that may leave some players scratching their heads a bit is the respective amounts of time you'll spend playing as Dante and the new character, Nero. Of course, having playables other than Dante is nothing new, nor is having characters that look very similar to Dante (anyone remember Vergil?), but Dante's role in DMC4 is something more of a cameo than a lead, evoking shades of Metal Gear Solid 2.

Nero's new weapons and abilities are a nice change of pace, however, and the game looks and sounds brilliant. One of Capcom's biggest franchises is back—with a vengeance. ▲

Harvey Birdman ATTORNEY AT LAW

The People Rest-by Chris Trumble

\$29.99 (PS2, PSP); \$39.99 (Wii) • ESRB: (T)een
Capcom • www.capcom.com/harveybirdman

Capcom's new Harvey Birdman: Attorney at Law game for the PS2, PSP, and Wii is a bizarre amalgamation of one of our favorite TV shows and the publisher's Ace Attorney games, in which players seek to win court cases by examining evidence and questioning witnesses.

The game is essentially five playable Birdman episodes, so if you're not a fan of the Adult Swim send-up of 1960s-era Hanna-Barbera cartoons, you might miss its appeal. Birdman fans, however, are in for a real treat; the only thing missing from the game is Stephen Colbert, who

voices Phil Ken Sebben and Myron Reducto in the series.

HB:AaL is pretty short; each episode takes about an hour to play through, but there's some replay value in going back and making alternate dialogue choices so you can squeeze every last drop of comedy out of the game. And in the end, we think there's plenty of that to justify this game's bargain price of \$29.99. ▲



GEOMETRY WARS GALAXIES

Life Beyond Xbox Live Arcade-by Dr. Malaprop

\$39.99 (Wii); \$29.99 (DS) • ESRB: (E)veryone • Sierra Entertainment • geometrywarsgalaxies.com

Geometry Wars started simply in the garage of the original Xbox's Project Gotham Racing 2, where the left stick moved your triangular ship and the right controlled the direction of your fire. The game became a surprise hit during the Xbox 360 debut on the Live Arcade and has burgeoned into a retail game for the Wii and DS.

The Wii version includes the 360's Geometry Wars: Retro Evolved with 14 new enemies, co-op and competitive local multiplayer, and a handy battle drone for tough spots. We liked the ability to download a full version of Retro Evolved for the DS, and investing in the DS game opens up new levels on both versions.

We liked the Wiimote controls less, as they lack the accuracy an arcade shooter like this needs without Nintendo's classic controller (sold separately). For our money, taking the DS version on the road was more enjoyable, and its controls provided many hours of in-flight gameplay. Both versions offer the depth to justify the transition to retail. ▲





Harmony One Advanced Universal Remote

One Remote To Control Them All *-by Dr. Malaprop*

\$249.99 (PC, Mac) | Logitech

www.logitech.com/harmony

CPU Rating: ●●●●●

The Harmony One lets you stash away up to 15 other infrared remotes. To the chagrin of family and friends, watching DVDs or playing music on our Xbox 360 requires handling three bulky remotes and a game controller, with each requiring additional button presses. The Harmony remotes require a user to select from a list of activities (for example, Watch TV, Play 360, etc.), and pressing a single button runs through the commands to turn on and configure all necessary devices for the activity. Remote clutter diminishes, and life becomes just a little bit simpler.

An included USB cable is required for the initial setup when you connect the remote to your computer. Logitech's software logs in to an

online database, and you add devices based on the brand name and model of your electronics. An included wizard lets you easily map devices and related actions for each activity. The wizard works for nearly all tasks, and advanced options are also available.

The Logitech Harmony Advanced Universal Remote for Xbox 360 and the nearly identical, but more costly, Harmony 550 remote controls offer similar functionality at lower prices. However, the Harmony One features a superb, backlit key layout that's much more intuitive than the 550 and includes a docking station to keep the remote charged. The upper third of the remote features a touchscreen to select activities.

The image quality of this LCD puts to shame all its predecessors.

There is one caveat. The Harmony One does not support Bluetooth, so it's unable to control your PS3. Additional Bluetooth support (for example, to use the PS3's Blu-ray functionality) on this remote would have been a stand-out feature considering the lackluster design of Sony's own PS3 remote. However, it seems that Logitech hasn't completely forgotten PS3 Bluetooth functionality because its new DiNovo Mini (review coming soon) features both PC and PS3 remote and keyboard functionality. Overlook this caveat and you end up with an elegant and eye-pleasing Harmony One that can nearly do it all. ▲

Cyborg Command Unit

FPS-RTS-RPG-In-One *-by Dr. Malaprop*

\$39.95 (PC) | Saitek

saitekusa.com/usa/prod/cyborgcommand.htm

CPU Rating: ●●●

The Cyborg Command Unit has more than a passing resemblance to 2005's Saitek Pro Gamer Command Unit. Saitek seemingly updated the hardware and rebadged it with a new Cyborg branding theme, which looks more attractive.

If you already own the Pro Gamer, then there's not much else you'll get out of the Cyborg Command Unit. The Command Unit is a mini programmable pseudo-keyboard (à la the Belkin n52te) with a subset of a full keyboard and modes for FPS, RTS, and RPG games that can be switched on the fly. This well-constructed piece of hardware has 21 buttons (one is a SHIFT key) and a four-way analog hat switch. Twenty keys are fully programmable via the software for up to 144 commands.

The hardware is Vista- and XP-certified and features laser-etched keys with a bling-worthy backlit design. The unit is customizable for different hand sizes by allowing part of the chassis to move for ergonomic hand placement. We liked the Command Unit, but its use was primarily at LAN parties and nonmultiplayer games where we needed a full keyboard to type messages. ▲



Cyborg Rumble Pad

Turn It All Around *-by Dr. Malaprop*

\$34.95 (PC) | Saitek

www.saitekusa.com/usa/prod/p3600v2.htm

CPU Rating: ●●●●●

Xbox 360 gamers are used to having the Left Stick with a D-pad below, but PS3 aficionados are used to exactly the opposite. The Cybor Rumble Pad kills two birds with one stone by letting users detach the Cyborg module, which houses the Left Stick and D-pad, and reverse it. Both setups were comfortable.

An extra \$5 buys an Xbox 360 Controller for Windows. However, the 360 controller lacks some of the Cyborg's stand-out features, such as the Precision Control, which lets you get greater precision in games (for example, when sniping). Another standout feature is the FPS button on the gamepad, which maps typical PC keyboard and mouse commands to the buttons for instant gamepad support. Finally, the X-Mode driver lets the pad mimic an Xbox 360 controller. In all, this is very versatile wired controller for your PC. ▲



The Cutting Edge

by Barry Brenesal

Electronic Instruments II: The Telharmonium

By electronic instruments, I don't mean guitars, pianos, or organs. Those are standard instruments to which electronics have been applied, to amplify or alter their sound. Their development was clever, rather than imaginative, and sometimes downright bizarre. It's the difference between a person 100 years ago who thought, "A-ha! I'll put electricity through my instrument to reach crowds!" and one who said, "A-ha! I'll build a massive keyboard console whose tones are actually electronically generated sine waves and whose sound is conveyed through paper cone speakers to telephone receivers! And I'll throw in tonewheels for additional harmonics and pedals to change timbres! Mwa-ha-ha! Who's a good mad scientist? I am!"

While not exactly his own words, this does describe the Telharmonium that Thaddeus Cahill designed in 1897. It was the first instrument whose sound was electronically generated rather than enhanced, the first synthesizer, the first commercial use of broadcast technology, and the first broadcast relay over telephone lines. It was pretty cool.

Technologists of the period were impressed, too, though not always for the right reasons. Thomas Commerford Martin, editor of *Electrical World*, wrote an article that began, "In the new art of telharmony, we have the latest gift of electricity to civilization, an art which, while abolishing every musical instrument, from the Jew's-harp to the cello, gives everybody cheaply, and everywhere, more music than they ever had before." The insubstantial nature of such phrases as "abolishing every musical instrument," "gives everybody," and "cheaply . . . everywhere" meant futurists of the period were as grounded in reality as their descendants are today.

The extremely wealthy are usually ready to endorse an expensive novelty that doesn't diminish their power, and thus it proved with the Telharmonium. Consider: In an age when radio and television didn't exist, one of the main attractions to your swank little party of 120 of society's best would be an actual broadcast of a live concert by an electronic instrument many miles away into your library! Never mind the technological cutting edge; you were the social cutting edge, showing off the latest entertainment technology.

The Telharmonium's popularity was helped by stirring written testimonials from the likes

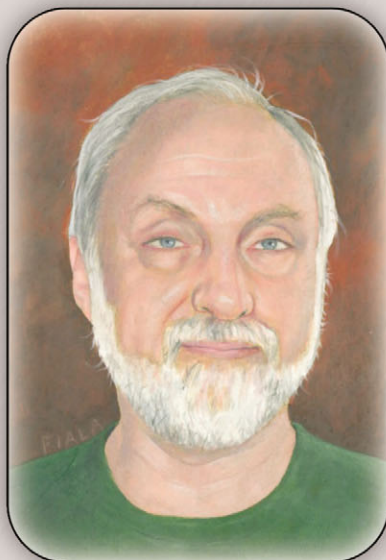
of the opera composer Giacomo Puccini. Better still were the stunts Cahill pulled to secure interest. In one, he was said to have planted a cone speaker beneath a manhole cover with subway access at a busy NYC intersection during afternoon rush hour, causing crowds to gather and toss coins. In another, he placed cone speakers outside a performance venue and broadcast the concert inside for all passersby. But given the primitive state of electronic communications, it was inevitable that some crosstalk would occur during these experimental telephone broadcasts. The opposite happened, as well. Unaware of

what Cahill was up to, some telephone owners complained to their telephone company that their conversations were being interrupted by strange music.

The inventor-promoter was further hampered by ballooning costs over three increasingly powerful versions of the Telharmonium. The bare facts of the second model are telling: It was 60 feet long, weighed roughly 200 tons, and employed 145 gear-driven electric motors, one for each key. The instrument had to be dismantled and shipped on 30 railroad cars when it was sent to New York in 1906 for a concert series and to secure customers. Doing things up in style was as much a requirement then as it is now to gain the attention of affluent potential patrons, but the draw of the thing was its novelty value, and the key to working a novelty market successfully is to know when to get out. Cahill didn't. Radio was on the way by the time the century's second decade rolled along, and the electronic instrument that had once charmed audiences changed very little in terms of sound and offerings. The New York Cahill Telharmonic Company went bankrupt in 1914.

The rest of the story is rather sad. The second and third versions of the instrument were dismantled and destroyed. Thaddeus' brother Arthur preserved the smallest and earliest one until the early 1950s, when he circulated a letter seeking a museum to house the relic. Nobody was interested, and the first Telharmonium was finally sold for scrap. Cellists and Jew's harp players everywhere breathed a sigh of relief, however.

Until next month. ▲



Barry Brenesal has written more than 1,000 published articles and reviews on electronic technology since 1987. His first personal computer was a Radio Shack TRS-80 model 100. It was last seen functioning as a boat anchor.

Wax nostalgic with Barry at
barry@cpumag.com



Software Tips & Projects

The Art Of Black & White

Black-and-white photography may seem a bit old-fashioned, but aesthetically, it's a great way to bring out texture and detail in an image. Until recently, image resolution and printing methods in digital photography have not matched some of the technical requirements for good black-and-white imagery. But in an age of hi-res digital SLRs and photo printers with multiple black/gray inks dedicated to producing neutral grayscale, black and white is back in style. However, if you really want to get the most out of the black-and-white technique, don't just use the grayscale toggle in your camera. New tools in advanced programs such as Adobe PhotoShop CS3 give you tremendous control over images that replace a vibrant color palette with a dramatic tonal range.

Get The Picture?

Before you even get to your imaging software, the two rules of thumb for digital black-and-white photography among professional shutterbugs is to shoot in color using a RAW format. While most advanced D-SLRs and compacts offer an in-camera monochrome/black-and-white mode, the desaturation processing here will always be inferior to what you can achieve later in software. Shooting in RAW format preserves more of the original image detail and leaves you more flexibility to adjust the balance of tones when you edit the image.

The flexibility of RAW images becomes clear immediately when you open one of these files in the Adobe RAW editor (a free

plug-in for PhotoShop from Adobe). Use the tab labeled HSL/Grayscale to bring up sliders that control the intensity of eight color channels. Check the Convert To Grayscale box, which desaturates the image but retains all the original color information. This means that you can adjust the yellow slider, for instance, and change the way that particular color converts to gray. Now, use the sliders to change the gray levels for discrete color channels.

In the image of our dog in her Halloween outfit, we converted the RAW image to grayscale. We decreased the intensity of the yellow channel, which darkened only the formerly yellow eyes on the costume. By reducing the Orange channel, we also darkened mainly the flesh tones and sunlit floor in the background. And turning down the Purple channel helped bring out more contrast between the costume bat wings and the reddish ears.

A New Layer Of Gray

With the revival of interest in the expressiveness of black-and-white imaging, Adobe has pumped up the latest version of PhotoShop with some very good tools. Once you have imported a RAW file into the main PhotoShop desktop, or started with a JPEG, the best way to manipulate grayscale is with a special Adjustment Layer. Go to Layer/New Adjustment Layer/Black and White to bring this up. Give the layer a name and click OK. The image will desaturate and offer a menu of hue sliders.

Before playing with the individual colors, try applying some of the color

filters in the drop-down Preset menu. Classic black-and-white photographers often use colored filters to block out certain color values on black-and-white film to create a dramatic effect. PhotoShop CS3 simulates those effects in software. So, for instance, applying a blue filter to a landscape will filter out the blue in the sky and leave you with a relatively white sky. Conversely, to get that prized dark sky effect, apply a red filter and watch a blue sky turn inky.

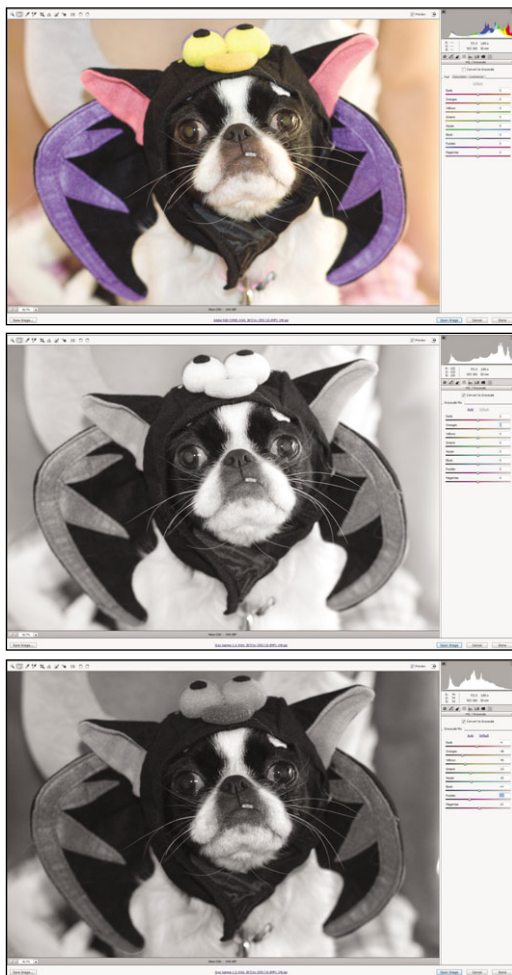
You get even greater flexibility by setting the Preset to Custom and using the individual sliders to affect specific hues. In the lighthouse image, we pulled the sliders for both the Blues and the Cyans

Windows Tip Of The Month

Most users already know how to take a quick and easy screenshot in Windows. You just tap the Print Screen button, and the current Desktop is dumped as an image into the clipboard. You then simply open MS Paint and press CTRL-V or the Paste command to paste in the screen shot. But did you know that you can also grab only the active window rather than the full Desktop screen? To do this, simply hold the ALT key as you press Print Screen. Then paste into MS Paint as usual.

Registry Tweak Of The Month

In Vista, you can add context menu commands that will copy or move a selected item to another directory. For the Copy To command, open Regedit and go to the HKEY_CLASSES_ROOT\AllFilesystemObjects\shell\ContextMenuHandlers key. Right-click the key and click New and Key. Type {C2FBB630-2971-11D1-A18C-00C04FD75D13} (brackets included) as the new key name. You don't need to enter a new Value for this key. Vista will make a new "Copy To" command in the context menu that will bring up a file box to target a destination for the command. For the "Move To" command, enter another new Key named {C2FBB631-2971-11D1-A18C-00C04FD75D13}. In both cases, the effect is immediate.



By playing with the color channels in a desaturated image, you can adjust the image's discrete gray tones.

to the left, which considerably darkened our sky. But at the same time, we moved the Greens slider far to the right, which lightened the foliage and gave them more detail. One of the aesthetic appeals of black-and-white photography is achieving a wide tonal range of grays.

Selective Color

One of the coolest tricks you can apply to black-and-white imagery, selective color, is actually among the simplest to pull off in Photoshop. You can apply a single area or multiple select areas of color to a base black-and-white image by using the power of layers. For instance, in an artsy black-and-white close-up portrait, you could apply the color from the original color image just to the lips or the iris of the eyes for special effect. Or

you can isolate color onto a single object in a busy cityscape. The beauty of the Photoshop approach is that rather than simply applying a monotone dye to the black-and-white image by painting a color onto an object, Layers allow the full color palette of the original image to show through in specific areas.

To do this, start again with a color digital image. Use the Adjustment Layer process we walked through earlier to desaturate your image to black and white and adjust the hue levels as you like. In the Layers pane to the lower right of the desktop, you should see two layers, one labeled Background (your original color image) and the second labeled Black & White 1 (or whatever you named this desaturated layer). Highlight the Black & White 1 layer by clicking it. Choose the area of the image to which you want the original color to show through and use the Zoom tool to enlarge it. You are going to be doing some tight detail work, so you will need to get in as close as you can to the outlines of the object to which you'll apply color.

A basic understanding of image editing layers will clarify the principles at work here. In image editors such as Photoshop, layers are like glass panes applied on top of the original image. In the case of the black-and-white layer, we applied a monochrome effect onto the entire color image. If we were to use the Photoshop eraser to delete selective pieces of that monochrome layer, then the original color will show through in those "erased" areas.

So, with the black-and-white layer highlighted, choose the Eraser tool in the left hand toolbar. The top line tool menu now will have the Eraser tool on the far left and the Brush selector next to it. Choose the Brush drop-down and pick a brush size and type that will let you fill in the large portions of the

selected areas. As you apply this eraser to the selected area, the original color should show through. In order to stay within the proper lines of your object, you will need to make your brush size small and more precise as you get closer to the edges. You can also use the Zoom command to get in closer for more precise edge work. If you do happen to go outside the line and apply color where you didn't intend, you can correct the mistake easily. Simply click the Brush tool on the toolbar on the left hand of the screen and use the brush in this mode to reapply the black-and-white overlay to any areas you like. Then switch back to the Eraser tool to finish the coloration. Photoshop pros know other methods for achieving the same effect, but this is the quickest and easiest we have seen.

While we performed these monochrome tricks in Adobe's Photoshop CS3, keep in mind that similar commands and principles can be applied in the more affordable Photoshop Elements, as well as Paint Shop Plus and other image editors. ▲

by Steve Smith

Infinite Loop Back To The Past

Wanted: One family willing to spend a week without iPods, laptops, cell phones, the Internet, DVD movies, and TiVo. What? No takers? That was the result recently when a researcher attempted to transport a family back to life in 1985. It was all a part of an experiment to see how our lives have changed since, with the request for volunteers made in a local newspaper. Forced to use his own family as the guinea pigs, there was cooperation, initially. In the end, his daughter's MySpace comment said it all—"I learned that you guys had no lives in 1985."



Source: www.technewsworld.com/story/60896.html

When 32 Is Greater Than 64

Before we really discuss Xen, we need to talk about processors. If you're running a 64-bit processor, you may have been tempted to install a 64-bit version of Linux. Although this has some benefits, it's going to cause nothing but headaches when you try to use Xen.

To understand why, you have to start by knowing that, with the exception of some of the very latest processors, you can't run virtual machines under Xen that are meant for a different architecture type. So, for example, if you install a 64-bit Linux distribution as your base operating system, your dom0 (the base administrative virtual machine) will need to be a 64-bit version of Linux. More to the point, the other virtual machines (referred to as domU images) will also need to be 64-bit images.

So what's the issue? First, you almost certainly don't want to build a domU image from scratch. Unlike VMware, where you just boot from the installation media and install the OS, you need to start with a special version of the domU's OS installation software when installing a Xen image. That's because Xen requires special modifications to the version of the OS that you install as a domU image. For example, if you want to install OpenSolaris, you need to get your hands on the special Xen OpenSolaris installation image, not the generic OpenSolaris media you'd use to install OpenSolaris under typical circumstances.

The very bad news (for 64-bit users) is that there are many more 32-bit domU images out there right now than 64-bit ones. So, you could go through the trouble of installing a 64-bit Linux distribution, getting a Xen dom0 image running on it, only to find that you couldn't find anything interesting to run as domU guests. Now, if you want to use Xen for pure virtualization



Warm Up To Penguins

The Zen Of Xen

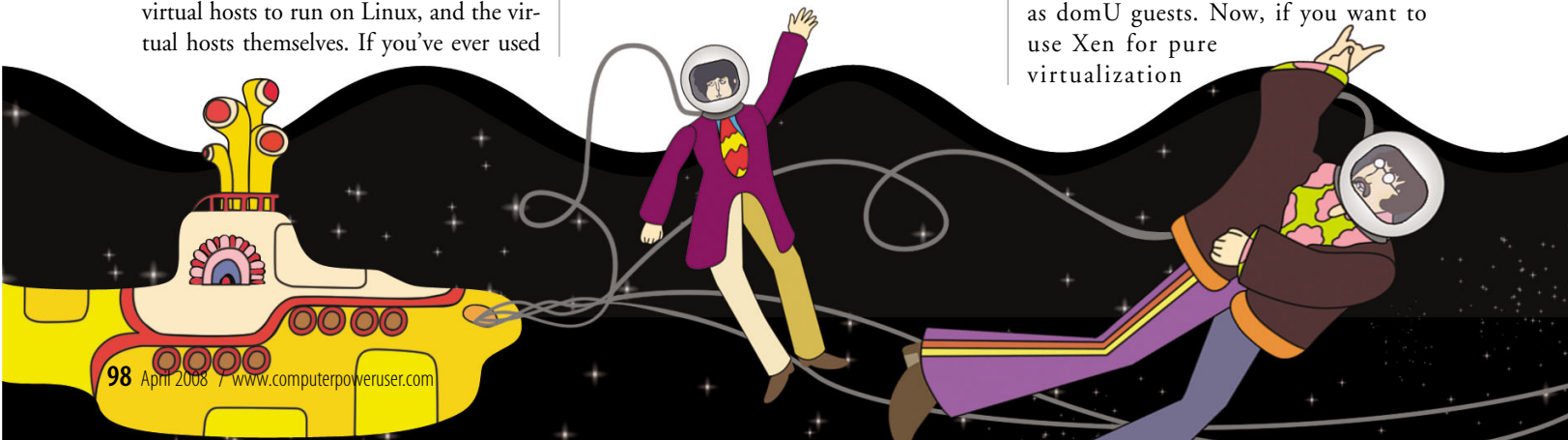
One of the hottest recent topics in the computer industry at this time is virtualization. Products such as VMware and Microsoft's Virtual PC are trying to take advantage of the increasing demand to run virtual computers on top of a physical host. There are several reasons to do this. If, for example, you need to run a number of different versions of Linux from time to time, you can run them as virtual systems on top of a stable host without worrying about constantly reinstalling or corrupting your system.

For businesses, virtual machines let many users share a single physical host. Because a system rarely runs at 100% load all the time, you can usually load-balance and get more bang for your hardware buck with virtual systems.

Linux, of course, has a virtualization application, too: Xen. Xen is an open-source project organized by XenSource (www.xensource.com), which is in turn owned by Citrix, known for GotoMyPC (www.gotomypc.com), among others. Xen consists of a hypervisor, which is simply a software package that enables virtual hosts to run on Linux, and the virtual hosts themselves. If you've ever used

VMware, there are some significant differences between how VMware (and Virtual PC) handles virtualization and how Xen does it. For example, VMware runs as a program (or service) that the virtual hosts run inside, but Xen actually is part of the Linux Kernel. The "host" machine is just another virtual machine (or domain, as Xen calls them) running on the hardware. Although this may seem a bit strange conceptually, it seems to pay off performance-wise.

The good news about this approach is that it is more like the VMware ESX Server strategy, with the virtual machines running "close to the metal." In other words, it minimizes the overhead of managing the virtual machines. Xen enthusiasts claim that it uses as little as one-tenth of the overhead resources as traditional virtualization products. However (You knew there was going to be a however, didn't you?), it's definitely a more challenging product to install and use compared to VMware Server. You know those car ads that include a warning: "Professional driver, closed course"? Well, for the average user, installing Xen should come with the same kind of warning.



of the same operating system, this won't be an issue. You can merrily install a 64-bit version of Linux. But if you plan to use Xen to run heterogeneous operating systems (such as FreeBSD and OpenSolaris on top of Linux), you'll find things quite difficult if you started with a 64-bit Linux. In those cases, the solution is to install the 32-bit version of your distribution as the base operating system.

Install Xen

Without a doubt, the easiest way to install Xen is when you first install your distribution. Most modern distributions such as OpenSUSE will offer Xen as a package you can add during the initial installation process. If Xen isn't available or you want to add Xen to an existing distribution, the installation process will vary greatly according to your distro. Some, such as those in the Debian family, have a number of useful Xen-related tools that you can also install. Your best bet is to check your distro's forum/wiki. You can also try Xen's Web page for distribution-specific information.

Once you install Xen, you need to reboot your system. If you did things correctly, you'll see a new option in your bootloader, one that starts with Xen. If you select this, you'll boot into Xen with the dom0 (administrative image) attached to your console. It will look a lot like Linux normally would, so the best way to determine that you're really running inside Xen is to use the "xm list" command as shown. (See figure 1.)



Companies are increasingly using virtualization technologies like Xen to increase computing resource flexibility.

```
james@james-laptop:~$ sudo xm list
```

```
Password:
```

Name	ID	Mem(MiB)	CPUs	State	Time(s)
Domain-0	0	1873	2	r	34.3

Figure 1

We can see domain 0 is running. So now we're ready to install our first guest domain (a domU, in Xen parlance, if you recall). Now, we consider ourselves fairly savvy with Linux, but after a solid week trying to get an example that demonstrated running a cool foreign operating system using Xen and failing miserably, we were forced to fall back on installing a second copy of Debian . . . under Debian. As it turns out, if you install the "xen-tools" package, this is relatively simple to do. You just use a command like:

```
#xen-create-image hostname=test.my.etch \
—ip=192.168.1.228 —dir=/xen/etch1
—dist=etch —debootstrap
```

This essentially tells Xen to create a new image running the Debian "Etch" distribution with an IP address of 192.168.1.228 and using the /xen/etch1 directory to hold the image files that contain the root and swap file partitions for the virtual machine.

Now, when we say "relatively easy," we mean it only took us a few hours reading Web pages and forums to find the three things we needed to change to get things to work. (We needed to change the kernel and initrd settings in our xen-tools.conf, install the network bridging package, and configure our Xen installation to set up bridged networks. However, once that was done, we were able to

run the xen-create-image command and

then start the image with the command: # xm create test.my.etch.cfg. To connect to our new domain, we used the following xm console command: roadwarrior:/xen# xm console test.my.etch.

Professional Drivers Only

Reading this article, you might think that we're not big fans of Xen in its current form. And you'd be right. Xen represents what we hate most about some open-source projects: the attitude that making it easy to use is of secondary importance. The frustrating thing is that Xen, at face value, is tremendously powerful and could be a wonderfully useful tool to have on your belt. But right now, it's an adventure into the darkest depths of the jungle to get it working for even the simplest cases. Xen apologists will disagree, but the reality is that Xen is a powerful tool that currently needs a PhD to operate. ▲

by James Turner

Infinite Loop

Yellow Submarine Voyages To Outer Space

The rock 'n' roll band that dominated the planet in the '60s may soon dominate the cosmos, if NASA has anything to say about it. On Feb. 4, NASA transmitted the Beatles' single "Across the Universe," well, across the universe. Aimed at Polaris, the transmission commemorates the 40th and 50th anniversaries of the band's recording the song and NASA's founding, respectively. Plus, it'll show aliens our species has some musical talent.

Source: www.networkworld.com/community/node/24574



Shavings From The Rumour Mill

by Mike Magee

Graphics Market Gets Galvanised

I knew someone would buy Ageia, but my money was always on ATI before it got assimilated by AMD, never Nvidia.

The news, when it happened in early February, caused Nvidia's stock price to fall. I'm more interested in whether there was a fall in the spirits of Ageia staff who didn't know it was going to happen until it did.

Because before Ageia was even up and running, I'd had conversations with people from AMD, from ATI, from Intel, and from other semiconductor firms who said they'd been approached with a view to being poached from their existing allegiances.

They wanted to know what I thought, and while it's fair to say I am no expert on the graphics end of the market, my opinion was that Ageia hadn't a snowball's hope in hell of becoming anything other than a vehicle for being bought amidst the raging battle between ATI and Nvidia.

Did Nvidia buy Ageia just because it could? Nvidia's corporate culture is interesting; the company is tightly run, expertly spun, and understands how to make money. There is a great deal to admire about Nvidia. Its CEO Jen-Hsun Huang is wedded to his company, and his drive is legendary.

There are rumors that AMD was negotiating to buy Ageia towards the end of last year and had offered \$150 million to snap it up, although the suggestion is that deal fell through at the last minute. It's not entirely clear to me what either AMD-ATI or Nvidia get anyway from acquiring Ageia, apart from some of their ex-employees. The technology showed some promise, but how well it can be integrated into existing lines is debatable, at best.

But there are shavings from the rumour mill that worry us a little. First of all, we understand that the strained relationship between Nvidia and Intel is a lot more strained now than it's ever been. This, of course, is because Intel has its sights on the graphics market with its Larrabee project this year.

Intel spent a considerable amount of effort during the course of last year hiring people to work on this project, and there can be no doubt that its entering Nvidia

and AMD/ATI's space is a severe threat, provided the chip giant executes its strategy properly.

Nvidia is, therefore, between a rock (Intel) and a hard place (AMD). Both Intel and AMD own the motherboard and chipset business, and that puts further pressure on Nvidia. Both AMD and Intel have designs on the graphics business. Intel is the dominant player in the semiconductor market, but AMD still harbours dreams of competing with its bigger brother.

I have the feeling that Nvidia is at its best when it is under pressure.

The company culture is very driven, as is Intel's. You could describe Jen-Hsun Huang as the 21st-century equivalent of Intel's Andy Grove. The rumor down at the saw mills last year was that Nvidia tried to snap up Centaur, part of Taiwanese megafirm Formosa Plastics' business and a company that can make a legit case for owning a share in the x86 chip market.

In the end, Nvidia didn't buy an x86 licence. Apparently the licence could have caused some problems, although steeped as we are in x86 history, we somehow doubt that is the case. Lawyers are very expensive.

Nvidia is a dyed-in-the-wool American company, based in Santa Clara, just like Intel. I wouldn't be surprised if Nvidia had a case in U.S. regulatory terms that it was being squeezed out of the graphics market by Intel and AMD. It surely cannot be in any of our interests that Nvidia ceases to exist because of monopolistic practices by American semiconductor companies.

Here's an idea that's even more bizarre: Imagine if IBM decided to invoke clauses in its ancient contract with Intel and baled out not cash-strapped AMD, but Nvidia. At a stroke, IBM would be able to shake its fist, forged in memories of times of yore, at Intel and at Microsoft. There would be no regulatory problems. IBM has been subject to close U.S. government scrutiny for decades. The white knight on the white horse would be able to reconcile the chipset business, because servers and services are important to Big Blue. Always have, and always will be.

Just a thought. Save Nvidia. We need it. ▲



Mike Magee is an industry veteran. He cut his teeth on ancient products like the Dragon and the Japanese PC platforms long before the IBM-PC won. He worked for a corporate reseller in the mid-'80s and saw the Compaq 386 sandwich box and every GUI known to humankind. Mike decided that the way to go was the Interweb around 1994 after editing PC mags in the late '80s and '90s. A co-founder of The Register, Mike started the chip-driven INQUIRER (www.theinquirer.net) in 2001. He has contacts from top to bottom in the business, spanning the entire chain, who help him root out interesting rumours and speculation.

Send rumours to "Mad Mike"
Magee at mike@cpumag.com

Wagging The Dog

by Rahul Sood

Valve For Windows

A little over a year ago, Microsoft was making all sorts of noise about its renewed Games for Windows initiative, touting it as the savior of PC gaming and acting like it was the most revolutionary thing since the invention of the joystick. The Games for Windows vision was compelling; imagine walking into a game retailer and seeing a section of games dedicated to Games for Windows, all of which would support any approved gaming controller out of the box, and some of which would support “Tray and Play.”

Many industry players were interested in the concept of making the PC gaming experience easier, but some of us were a bit skeptical due to the fact that Microsoft was driving the initiative. Trouble is, Microsoft is notorious for starting major initiatives that barely get halfway through development before the company decides either to kill them or launch them. It's sometimes hard to tell whether there is wide internal buy-in on such initiatives.

I have to admit, I was intrigued with the potential of Games for Windows, and I got caught up in the hype—until, that is, I saw Halo 2 with the Games for Windows moniker on it. Just when I thought things couldn't get worse than an original Xbox port, I tried Shadowrun, which was equally bad. The lack of cross-platform gaming support really buried the program for me. It was like fool's gold, and I was one of many who were played by the biggest player in the industry. Perhaps GfW was not as compelling as we once hoped.

Shortly after these fiascos, Peter Moore, corporate vice president of Microsoft's Interactive Entertainment Business division, decided to jump ship for EA. In the process, the director of Games for Windows stepped away from his role and was apparently replaced by someone else who I have yet to hear from.

So, where does that leave the initiative? Apparently it leaves a bunch of branded boxes on the shelves with an unknown future and some interesting marketing messages that have successfully generated more confusion over what “Games for Windows” actually means to the end user. On top of

that, I'm starting to question whether Microsoft is capable of driving its commitment to PC gaming.

Now, before you start interpreting this as a funeral dirge for PC gaming in general, let me just say that we've all heard the rumors of PC gaming's death over and over again, and like many, I'm tired of hearing them. PC gaming is not dying, so get over it.

Valve is arguably the best PC game developer out there. Gabe Newell and his team make some of the best games ever, including the Half-Life series and Counter-Strike. Over the years, Valve has done almost everything right, and while they're quiet about it, the success of Steam is undeniable.

Recently, Valve announced that Steamworks, a complete suite of publishing and development tools including such things as copy protection, social networking services, and server browsing, is now available free of charge to developers and publishers worldwide.

In a nutshell, this system could significantly cut down on PC game piracy, which could in turn begin wooing developers and publishers back into the fold. And, of course, it will drive Steam into even more homes. In implementing Steamworks, developers will gain access to real-time stat tracking, encryption and anti-piracy measures, voice chat, multiplayer matchmaking, and social networking.

The buzz on the Internet seems to characterize this as “Games for Windows done right” and hails Valve as the saviors of PC gaming.

If you haven't tried Steam yet, I recommend you take a look. It's the best game-distribution system on the planet, even remembering your purchases so that when you get a new PC, you can re-download them with no issue.

In the meantime, don't worry about PC gaming—it's not going anywhere. It continues to grow, and there are new models of monetization coming into play, as well. As for Games for Windows, well, if anyone at Microsoft would like to discuss this, please feel free to contact me and we'll set up an interview for another column. ▲



Rahul Sood's love for computers started at the young age of 11. Much to the shock and dismay of his parents, he ripped apart his brand-new Apple IIc and painted it red before turning it on. His parents' dreams of having a doctor for a son were shattered when college drop-out Rahul founded what is now one of the most respected high-end computer companies in the world, Voodoo Computers.

Send your opinions to this opinionated guy at rahul@cpumag.com



Look For *CPU* At These LAN Parties Across The Nation!

03.07.08

Digital Overload, New Haven, CT
www.digital-overload.com

Madicon 17, Harrisonburg, VA
www.madicon.org

03.08.08

KILANFest, Louisville, KY
www.kilanfest.com

Whempy's LAN Party, Columbus, OH
whempyslan.org

03.15.08

Iron Storm 8, Gibsonsia, PA
www.pittco.org

Muncie Gamers, Muncie, IN
www.munciegamers.com

PeaceLoveandRockets, Arlington, TX
www.peaceloveandrockets.org

03.28.08

PointBlankGaming #3, Cheyenne, WY
www.pointblankgaming.com

April 08

theGXL, Millville, NJ
www.thegxl.com

04.05.08

Plan 9, Kalamazoo, MI
www.whatistheplan.com

04.11.08

FragFest, Utica, NY
gamers.sunyit.edu

LAN OC, Ohio City, OH
lanoc.org

04.19.08

Appalachian State University Gaming Club,
Boone, NC
www.gaming.appstate.edu

NEARFF, Searcy, AR
www.harriscustompcs.com.nearff

Overkill LAN Party, Tampa, Florida
www.overkill-lan.com

Whempy's LAN Party, Columbus, OH
whempyslan.org

Spring 08

Xodus, NY
www.egslan.com

05.02.08

ALL Your Base Lan, Winnipeg, Manitoba, Canada
www.allyourbaseonline.com

05.10.08

Whempy's LAN Party, Columbus, OH
whempyslan.org

05.17.08

South Oakland County Lodge 130, Ferndale, MI
www.fop130.org.index.html

05.22.08

PAGLAN 11.NVGA SuperCON, Albuquerque, NM
www.nvgasupercon.com

05.26.08

NEXLAN, Spokane, WA
www.nexgenconsulting.net

05.31.08

OnTargetLan, Arkansas
www.ontargetlan.com.news.php

06.21.08

Intel LanFest: Sacramento, Grass Valley, CA
lanfest.intel.com

Whempy's LAN Party, Columbus, OH
whempyslan.org

07.19.08

LAN Stanley, San Antonio, TX
www.myspace.com.lanstanley

Whempy's LAN Party, Columbus, OH
whempyslan.org

07.24.08

Fragapalooza, Edmonton, Alberta, Canada
2007.fragapalooza.com

09.01.08

LAN OC, Ohio City, OH
lanoc.org

10.10.08

Necronomicon, Plan City, Florida
www.seads.org.LANParty.necrolan.htm

11.07.08

ALL Your Base Lan, Winnipeg, Manitoba, Canada
www.allyourbaseonline.com

12.31.08

LAN OC, Ohio City, OH
lanoc.org

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Active Matrix Gaming LCD Monitor
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Technically Speaking

An Interview With McAfee's Dave Marcus, Part 2

Dave Marcus currently serves as security research and communications manager for McAfee Avert Labs. He formerly served as senior security strategist for McAfee, with more than 10 years of technical experience in network solutions, information technology security, network performance and integration, and e-learning solutions, as well as management and consulting.

by Barry Brenesal



CPU: Let's discuss the incidence of international attacks upon governments. The Virtual Criminology Report mentions denial-of-service attacks from Russia on the Estonian government, news, and bank servers for several weeks. The Russian government of course denied any involvement in this but has refused to look into the matter. The timing of it, at the lowest point in Russian-Estonian relations in decades, would seem to lend credence to Estonia's claims. What, in your opinion, could a small but relatively prosperous nation like Estonia have done to make itself more cyber secure?

Marcus: When you want to achieve a good defensive deployment, you have to address it at a variety of levels. You can't just protect the host, you can't just protect the network or the routers. You have to do every appropriate step at each of those levels. At the end of the day, you must have certain ISP and network protections in place, server-level and host-based level protections in place. There's no other way to successfully mitigate against a denial-of-service attack, which is devastating.

CPU: Your report quotes from Dr. Richard Clinton, who is a cyber-security expert at Cambridge University. He writes, "What we need is banks controlling transactions more carefully, spotting patterns, limiting transfers out to trusted recipients like gas companies." But what makes a trusted recipient? Surely a gas company isn't an individual but a corporate entity whose management changes and can only be trusted so far. Isn't a company only as good as the people making the decisions at the top?

Marcus: The question of trust is the lynchpin of the issue. How do you know that the person you're sending content to is valid? How can you verify the integrity of it during transit?

CPU: It would seem from the examples you've given, though, that nobody can be ultimately trusted on the Web. Because everybody is subject to attacks that could turn their computer into a bot.

Marcus: I think there is a lot of deniability in any Internet-related activity.

Addresses can be spoofed on the Web. There is a degree of lack of trust built into the anonymous nature of certain types of Internet communication. It devolves down into a combination of trusting your sender and receiver to a degree and then insuring integrity of the data as it's being transferred, and assuring its authentication when it's received. I think there are a lot of things that could be built into an inherently insecure system that could still make it possible to do secure data transfers within.

CPU: It's stated in the report that attacks targeting Web-based services will constitute one of the 10 biggest global security threats in 2008. Which would seem reasonable, as that's a very easy way to hit a large number of people. Yet one of our previous guests stated that these attacks are already occurring on a wide scale but that they're seldom announced to avoid panic.

Marcus: I would say that's probably debatable. The fact that they occur regularly is absolutely true, and I think they

will only increase. We already have a lot of traffic to specific sites, and that makes them a much more attractive target. If I could somehow insert my malicious code through an invisible frame or redirect, I'm going to have a massive amount of success. When you look at the MySpaces of the world, the Facebooks—the sites that have an established presence, that have lots of dynamic content—I think it is only logical to assume those types of sites are going to be primary targets in the future.

But in this day and age, I honestly don't think you could keep a successful attack against one of these sites secret when it happens.

CPU: If that was one of the 10 biggest global security threats expected in 2008, can you summarize a few of the others for us?

functionality. Not surprisingly, we saw some significant worm development around Skype this year. It's definitely being looked at both by the underground and by a lot of valid security researchers as something of importance from both sides of the fence.

Among other upcoming security threats, we looked at virtualization, VMware and such, as being transformative to the security community. Not just from a data theft point of view, but also as very much affecting and changing the security community itself. Most people don't know that we've seen virtualization of malware for many years now. Viruses have ways of detecting when they're in a VM session, and they've been able to for a while.

We also discuss parasitic malware starting to make a comeback, with a definite growth between 2006 and 2007. That's interesting because the traditional viruses

effect that the Storm Worm has ultimately had—and not just because it used peer-to-peer as its protocol instead of IRC. It also had effects on malware in terms of encryption, distributed networking, etc. They found so many ways to recycle the code of Storm into new types of attacks, such as PDF spam and MP3 spam. We had never seen these things before.

We also talked about online gaming as a big, up-and-coming area for malware writers: Second Life, World of Warcraft, and such. This relates to the value of the gaming digital economy. Characters are bought and sold on eBay and on underground sites. As a result, we've seen this huge spike in password-stealing Trojans that target online gaming accounts. They actually use these stolen accounts to do what is called “Chinese gold farming.” It's literally something that people will do 12 hours a day. They make money in the

The question of trust is the lynchpin of the issue.
Who do you know that you're sending content to is valid?
How can you verify the integrity of it during transit?

—Dave Marcus

Marcus: We saw a big jump between 2006 and 2007 for the amount of vulnerabilities that were being reported in various VoIP protocols. There was actually a drop between 2005 and 2006, but that slump ended. I think what we'll end up seeing is an increasing number of theft-of-service attacks. I've even seen a couple of bot developments in those areas. It almost harkens back to the older phreaking paradigm of getting long-distance phone calls for cheaper.

CPU: So there's more money to be made elsewhere?

Marcus: They're more interested, I think, in some combined technologies such as Skype. That's fascinating to the underground for a couple of reasons. It's VoIP, and it's an encrypted channel. Plus, it's got all of that video and messaging

and worms were in many ways in significant decline. It's been about bots and Trojans for the last several years.

CPU: Your report mentions peer-to-peer networks displaying a dramatic increase in attacks. You specifically refer to the WINNY virus and note that “data breaches are not being stopped by corporate firewalls.” Would that be because the worm is coming from a reputable source?

Marcus: Yes, that is correct. WINNY was a really interesting event. It was a valid, commercially supported program. It caused a great many problems and was specific to Japan. But one thing that's true about peer-to-peer in general is the

farming of gold which gets sold to characters in the gaming world. We've seen a huge growth in this area of malware in the last couple of years.

CPU: How much money can be made this way?

Marcus: A gold farmer can make \$5 to \$10 an hour, using bots and automated scripts. When you live in a part of the world like China, that's a huge amount of money. It's something that the security community is taking seriously. We're doing a lot of education and outreach to the gaming community because of the amount of this activity. **CPU**

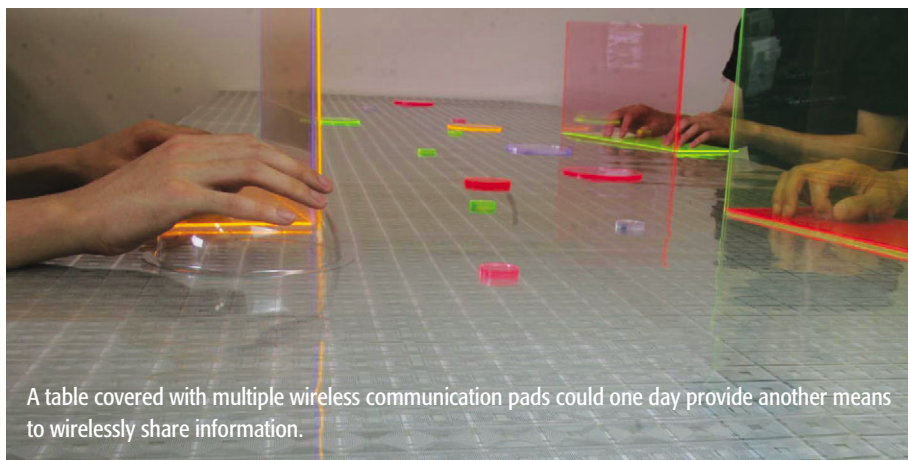


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Under Development

A Peek At What's Brewing In The Laboratory

"Padded" Network Showing Promise



A table covered with multiple wireless communication pads could one day provide another means to wirelessly share information.

Imagine walking into a conference room, sitting your computer down on the table, and immediately being able to share information with other devices without having to connect to a wireless network. Such a scenario might soon be a reality, thanks to new technology developed at the University of Tokyo.

Professor Takao Someya, associate researcher Tsuyoshi Someya, and their team have developed a wireless communication pad that networks multiple devices together when placed

on the pad. The sheet is 1mm thick and manufactured using a process in which transistors, MEMS (microelectromechanical systems) switches, communication coils, and nonvolatile memory cells are all printed directly onto the plastic with an inkjet.

Each pad consists of an 8 x 8 grid of cells, which consist of the above components, and a control chip that chooses the best route between devices. In order to initiate communication when devices are

placed on the sheet, data is first transmitted wirelessly from the sending device to the sheet via short-range radio signals. Then, the control chip creates a wired route on the fly by closing a series of MEMS switches to connect adjoining cells. When the information arrives at the receiving device, another wireless transfer occurs.

The communications sheet builds on and complements Someya's earlier invention, a plastic sheet that senses and provides power to devices placed on it, which we detailed last year. (See page 87 in the March 2007 issue of *CPU*.)

Someya has no explicit plans to market his device, though he reports that he has received a good amount of interest from several companies. Once he decides on a route for commercialization, the technology still needs further refinement before it's ready for prime time.

"Since we need to improve reliability and stability of printed organic transistors and printed plastic MEMS switches, it will take about five years to push our devices to the markets," Someya says. ▲

Data Riding Waves Of Sound & Light

Optical networks will offer much faster communications capabilities in the future, because of the speed at which light pulses carrying information can travel over optical fibers. But one barrier to creating an all-optical network is that there's no way to electronically store information contained in an optical pulse.

Duke University physics professor Daniel Gauthier and postgraduate student Zhao-ming Zhu, along with Robert Boyd, a physics professor at

the University of Rochester, have demonstrated a way of potentially overcoming that barrier by using a very high-pitched acoustic wave to capture and store information encoded in a laser beam.

In the researchers' experiment, they sent laser beams of slightly different frequencies in opposite directions down a standard, room-temperature optical fiber, and one of these beams was encoded with data. When the beams passed through each other, they created

an acoustic vibration called a phonon. The data encoded on the laser was imprinted on the phonon, effectively storing it for up to 12 billionths of a second. The team then retrieved the information by sending a third laser beam through the fiber.

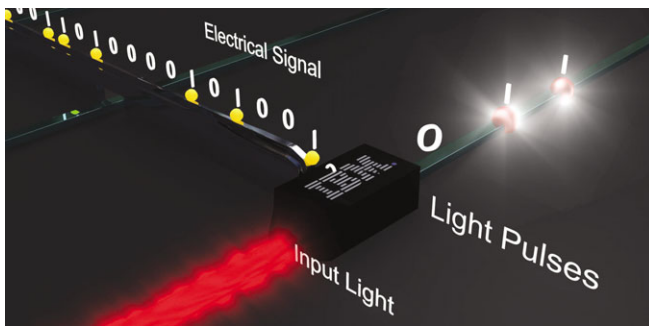
The researchers note there is a growing consensus in the photonic research community that keeping information in optical form, rather than converting to electronic and back again, will be important for high-speed optical networks to be successful because of the

high heat factor involved in the conversion damaging the delicate components.

The team's next research steps involve increasing storage time and decreasing peak power needed for the read/write pulses. "We hope to hit about 100ns storage time for 1ns-long pulses to get the peak power for the write and read pulses below 1W," says Gauthier.

Gauthier hopes that with continued funding of the research, the technology could be used in optical networks within five years. ▲

Supercomputer On A Chip



IBM's tiny modulator converts electronic information to light pulses and opens up possibilities of super high-density chips that use light instead of metal to pass information.

Smaller, faster, and cooler are three very important adjectives in any discussion of the future of electronics. Add "super" to those, and you're coming close to describing a significant research milestone researchers from IBM's T.J. Watson Research Center have

achieved, one that could someday lead to having the power of today's supercomputers on a single chip.

A team led by research scientist Dr. Will Green has developed a significantly smaller version of a Mach-Zehnder electro-optic modulator, a

device that converts electrical signals into pulses of light. At 100 to 1,000 times smaller than previous modulators, many of them could be used together to replace the copper interconnects on today's silicon chips.

IBM's most advanced chip currently contains nine cores, but the team hopes its research will pave the way for chips with hundreds—even thousands—of cores. Obviously, such chips would provide an enormous amount of computing power. And because there would be no metal interconnects, the chips would require less energy and produce less heat than today's supercomputers.

The team's optical modulator works by receiving an

incoming laser beam and either allowing the light to pass through or blocking it (in a kind of shuttering action), depending on the electronic information it receives. In this way, it converts the 1s and 0s, to light pulses.

Green says his team is working on making the modulator faster and exploring ways to lower power consumption so that multiple on-chip modulators don't produce too much heat. However, he also cautions us not to expect 100-core chips next year.

"A reasonable time to expect photonics to appear on a microprocessor chip would be somewhere in the 10- to 15-year range." ▲

Mocap For The Masses

These days, when you see a movie that includes digitally animated human characters, it's a good bet that animators used motion capture technology somewhere in the creative process. Optical systems, in which reflective markers or blinking LEDs are worn on the body and tracked by multiple cameras in order to triangulate position and track motion, are the most common and accurate. But these systems are expensive and require a highly controlled setting, limiting the type and scope of activities they can capture.

Researchers at the Swiss Federal Institute of Technology in Zurich, along with fellow colleagues at MIT and the Mitsubishi Electric Research

Laboratories, have developed a cheaper and more adaptable motion capture system that could one day be used anywhere to capture any kind of motion, including activities such as skiing and biking.

The system uses several small, inexpensive sensors, each of which includes an accelerometer and gyroscope, on a person's arms and legs to capture movement data. The sensors also emit ultrasonic beeps, which are picked up by microphones worn on the

torso. Then, software running on a small laptop carried in a backpack strapped to the subject calculates the distance the beeps travel from the sensors to the microphones. In doing so, the software can calculate the motion and position of the other sensors.

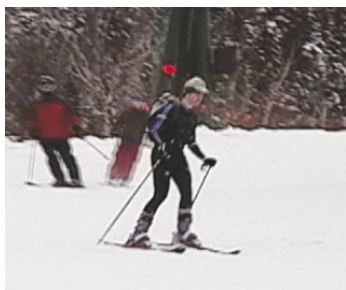
Although the system's results aren't as precise as those produced in a traditional motion capture lab (the bodies being tracked sometimes appear to shift or rotate in space because they lack a fixed point of reference), they're still very good, especially considering all of the system's parts are off the shelf and cost less than \$3,000.

"Already, the sensitivity of the sensors is quite good," explains

researcher Rolf Adelsberger. "As we used rather inexpensive parts, there is already room for improvement by only switching to 'more expensive' sensors."

The portability of the system lends itself to many potential applications beyond the movie studio, such as medical monitoring and physical therapy (for instance, capturing the motions that lead to repetitive stress injuries), athletic training in real environments (for bikers, skiers, etc.), and gaming (full-body video-game controls). With custom circuitry, the system could be even smaller, making it possible to ditch the backpack laptop for a more manageable, iPod-sized device.

Adelsberger believes that, with adequate funding and interest, a stable, commercial version of the system could be available within a year. ▲



Motion capture technology that uses small, inexpensive sensors may one day replace the traditional motion capture lab.

Q&A With Neil Charney

Neil Charney is general manager of the Windows client team. That means you can direct all of your questions about Windows Vista to him. Microsoft's newest operating system was a monumental project, with an estimated cost of about \$6 billion. It involved thousands of Microsoft employees, many who worked more than six years on the OS. Charney answered our questions about Windows Vista.

Q What is your preamble on the subject of the anniversary of Windows Vista's launch?

NC We're coming out of a strong third quarter. That was very encouraging. Adoption across the key segments is pretty much where it should be at this stage. Looking back over previous Windows releases over time, there are improvements that require change. We did a lot of investments in Vista around security, customer experience improvement. That change requires some tradeoffs. Part of the ramp onto the new platform requires some new user experiences. We're pleased with how that is progressing. Coming into the 2007 holiday season, it was fun to see new lines of PCs coming out that represent a great variety of experiences. Happy to see new offerings from companies like Dell, Sony, HP, that really change the form factors. There is always more work to do. We continue to innovate and add compatibility and reliability updates to the system. That is something that is part of the process.

Q What is in the service pack?

NC Like any service pack, it's not about new features. It's focused on updates of reliability, performance, as well as ongoing updates. It has improvements in user scenarios such as file copy, browsing the network, performance over a network, response time for resume from

sleep. There are also things for administrators and IT organizations, such as bit locker multiple volume support. We're on our way to releasing the service pack, and we'll have final capabilities as that comes out. The interesting thing about this release is we'll have continuous updates available through Windows Update. Customers are getting the benefits of SP1 prior to its final delivery.

Q What's the data on viruses and Vista?

NC It shows that with Vista, your PC is 50% less likely to be infected than with Windows XP Service Pack 2. It has far less critical vulnerabilities within 180 days after the release. When we launched, we knew we had done a lot of work around security. We had always said the proof is in the product once it's in the market.

Q There have been complaints about the speed of Vista.

NC It depends on what you're doing. We have provided updates that improved speeds. SP 1 will improve things like file copy and moving things over to the network. That will improve. It's a little early to make specific claims on that. From a user experience, there is an improvement in day-to-day functionality. Startup, access to the network, resume from sleep, and shutdown.

Q Shutdown has been frustrating. Why does it take so long?

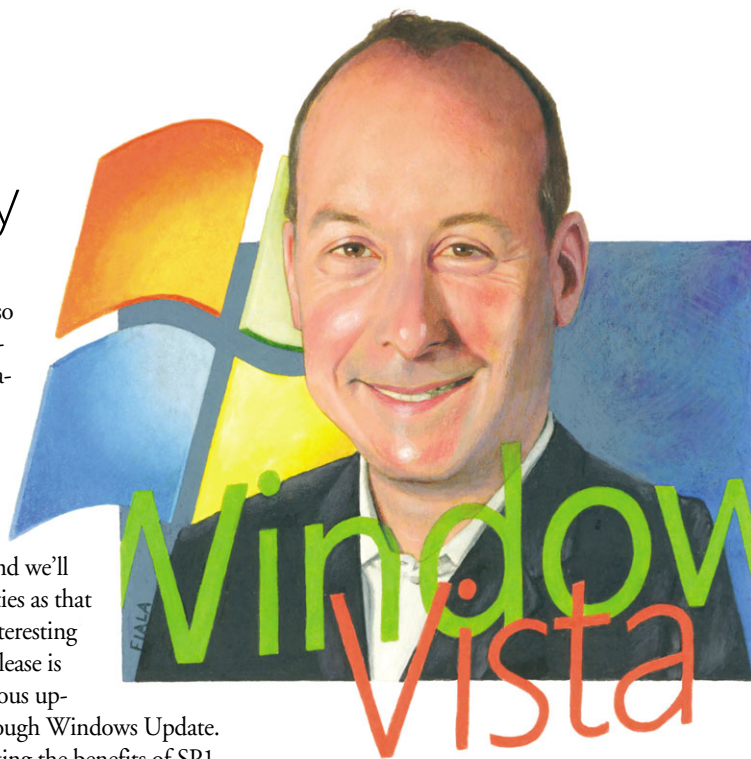
NC In some cases, shutdown can be slow because of a driver. You want the most up-to-date drivers and

BIOS for that piece of hardware. With some systems, it works. In other cases, it's a driver issue. We see significant improvements with SP1. It really is case-by-case. It waits to do updates until you shut down if they require a reboot. You can configure it so it doesn't do that. It's probably an update that requires a reboot.

Q What are the lessons that Microsoft has learned?

NC The security investment was a good lesson learned. That's an important investment to make. We could do work on communicating changes where we require administrative passwords for certain tasks. Not just for end users but also for our partners. We want them to provide the best experience out of the gate. It's interesting that getting the word out to people is very different now vs. Windows 95 and Windows XP. Every OS vendor has this. When you look at the blogosphere, it's great to engage in that community and make sure you're listening and responding to them. That's something we have worked hard to do. Overall, it's continuing to work with our partners and make sure they have the best experience. ▲

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